

Articles

Home Sanitation and Personal Hygiene as Risk Factors for Leprosy Incidents in Guluk-Guluk District, Madura

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Receive: 09 March 2024
Revised: 29 March 2024
Accepted: 20 April 2024

Abstract

Leprosy is still a health problem in the Guluk-Guluk District. Factors that contribute to the increase in leprosy cases are home sanitation and personal hygiene. House sanitation that does not meet the requirements creates a conducive environment for leprosy bacteria, and inadequate personal hygiene increases the risk of leprosy transmission. This research aims to analyze the relationship between home sanitation and personal hygiene and the incidence of leprosy. This research uses a case-control design. The independent variables are home sanitation and personal hygiene, while the dependent variable is the incidence of leprosy. Data collection is done through interviews, observation, and measurement. The samples used were 30 case samples and 30 control samples. The research location is in the Guluk-Guluk Health Center Working Area. The research time is January - June 2024. Sampling used a simple random sampling technique via lottery. Data were analyzed using chi-square and odds ratio tests. The results show a relationship between house sanitation, ceilings, floors, ventilation, personal hygiene, cleanliness of hands and feet, and the incidence of leprosy. There is no relationship between temperature, humidity, and bed cleanliness with the incidence of leprosy.

Keywords:

1. Home Sanitation
2. Personal Hygiene
3. Leprosy

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Instruction

Leprosy is a tropical disease caused by *M.leprae* bacteria, which attacks the skin, peripheral nerves, upper respiratory tract, and eyes [1]. *M.leprae* has a long incubation period, which often makes diagnosis and control of the disease challenging [2]. Leprosy that is not treated immediately has the potential to cause permanent disability. This disabling condition causes sufferers to feel shunned by some in society and even their own families. Sufferers also have difficulty finding work, so basic needs are complex to fulfill [3]. In the working area of the Guluk-Guluk Community Health Center, Sumenep, leprosy remains a significant public health problem.

Data on leprosy cases in the world was recorded at 174,087 cases in 2022. Indonesia is in third place, with a total of 12,441 cases in the same year [4]. In 2021, East Java Province recorded the highest number of leprosy cases in Indonesia at 1,839 cases [5]. Sumenep Regency recorded 297 cases in 2023. Guluk-Guluk Community Health Center is one of 30 Community Health Centers that has consistently

ranked highest in Sumenep Regency for the last two years, namely 2022-2023. In 2022 there were 30 cases recorded in 2022, then increasing in 2023 to 32 cases with a prevalence of 2.69 per 10,000 population [6].

One of the factors believed to contribute to the prevalence of leprosy is the sanitary conditions at home that do not meet the requirements [7]. Houses that do not meet the criteria can create an environment conducive to disease transmission. Research on the relationship between home sanitation and the incidence of leprosy has been carried out in various regions. Research in India shows that poor housing conditions, such as lack of adequate ventilation, significantly increase the risk of leprosy 1.64 times [8]. Another study in Baingkete found that poor housing conditions (OR = 0.47), especially inadequate ventilation, floor type, and residential density, are optimal places for leprosy bacteria [9].

Personal hygiene also plays an important role in the spread of leprosy. Research at the Wonoasri Community Health Center, Madiun Regency, found that not maintaining personal hygiene can increase the risk of contracting leprosy by up to 4,375 times because leprosy is transmitted through repeated skin contact over a long period and through the respiratory tract [10], [11]. Another study at the Waena Community Health Center, Jayapura City, related to 3,357 cases of deficient hand hygiene being affected by leprosy; this is because leprosy bacteria can reach the surface of the skin through hair follicles and sweat glands. Leprosy bacteria are transferred to new individuals if the individual comes into contact with a leper sufferer. Washing your hands can prevent remaining leprosy bacteria [12], [13], [14].

Many studies have identified the relationship between home sanitation and personal hygiene in the incidence of leprosy. However, there is still a significant knowledge gap in the specific context of the Guluk-Guluk Work Area, Sumenep. This research is essential because the unique geographical, cultural, and socio-economic factors of this region can influence the relationship between home sanitation and personal hygiene and the incidence of leprosy [15].

A number of studies have linked home sanitation and personal hygiene with the incidence of leprosy. Still, there has been no comprehensive research that specifically examines the risk factors for home and personal sanitation on the incidence of leprosy in the Guluk-Guluk Working Area, Sumenep. This study aims to fill this gap by identifying and analyzing specific risk factors that contribute to the high incidence of leprosy in this region. By understanding these factors, more effective and targeted interventions can be developed to reduce the prevalence of leprosy in the Guluk-Guluk working area, Sumenep.

Materials and Methods

This research uses a case-control design. A total of 60 samples were used in this study, with a 1:1 ratio between cases (30 samples) and controls (30 samples). Sampling used a simple random sampling technique. The case group is individuals diagnosed with leprosy, while the control group is residents who do not suffer from leprosy and live around the sufferer's residence. This research is located in the Guluk-Guluk Pukesmass Working Area, Sumenep Regency. The study was carried out in January – June 2024.

The independent variables used are home sanitation and personal hygiene, while the dependent variable is the incidence of leprosy. The measurement criteria for the house sanitation variable are ceilings that do not meet the requirements if the respondent does not have a ceiling/has a ceiling that is dirty and dusty. In contrast, a ceiling that meets the requirements is clean. A floor that does not meet the requirements if the floor type is made of earth or the floor is cracked and dusty, while a floor that meets the requirements is watertight and clean. Room ventilation/windows do not meet the requirements if they have an area of <10% of the floor area, while they meet the requirements if the area is >10% of the floor area. The temperature that does not meet the requirements is if the temperature is <18°C or >30°C, while the temperature that meets the requirements if the temperature is 18°C - 30°C. Humidity that does not meet the requirements if the humidity is <40% or >60%, while humidity that meets the requirements if the humidity is 40% - 60%. The measurement criteria for personal hygiene are poor hand and foot

cleanliness if the interview sheet score is 0 – 4, while good hand and foot hygiene if the score is 5 – 8. Poor bed cleanliness, if the sheet score results interview is 0 – 4, while good bed cleanliness is a score of 5 – 8.

Data collection was carried out through interviews, observation and measurement. The data analysis used is chi-square and odds ratio. This research has been carried out per research ethics guidelines and has been approved by the Poltekkes Kemenkes Surabaya ethics committee with registration number No.EA/2107/KEPK-Poltekkes_Sby/V/2024, and obtaining approval from respondents through informed consent.

Results

The following table below shows the distribution results based on the characteristics of respondents in the Guluk-Guluk Health Center Working Area, Sumenep Regency.

Table 1

Distribution of Respondent Characteristics in the Guluk-Guluk Health Center Working Area Sumenep Regency

Characteristics	Amount	Percentage (%)
Age		
Productive	48	80
Not productive	12	20
Total	60	100
Gender		
Man	24	40
Woman	36	60
Total	60	100
Type of work		
Work	40	66.7
Doesn't work	20	33.3
Total	60	100
Level of education		
Tall	23	38.3
Low	37	61.7
Total	60	100

Table 1 shows the results of the characteristics of the majority of respondents of productive age, 80% (48 people). Productive age is a respondent who is > 15 years old or ≥ 65 years old, while productive age is if the respondent is 15 – 64 years old. Regarding gender, most respondents were female, 60% (36 people). The majority of respondents had jobs, 66.7% (40 people). Respondents who do not have a job if they are not working, housewives and students. Most respondents' last educational level was low, 61.7% (37 people). Respondents have a low level of education if their previous education is no school - junior high school. In contrast, respondents have a high level of education if their last education is at least high school.

Table 2 shows that the majority of the case group had unqualified ceiling conditions, 63.3% (19 people), while the control group had qualified ceiling conditions, 80% (24 people). The statistical test results showed a p-value = 0.002, which means there is an association between the ceiling of the house and the incidence of leprosy. The house's ceiling is a risk factor for leprosy, with an OR value of 6.909.

The majority of the case group had floor conditions that met the requirements, 53.3% (16 people), while the control group had floor conditions that met the criteria, 83.3% (25 people). The statistical test results show a p-value = 0.026, which means there is a relationship between the floor and the incidence of leprosy. Flooring is a risk factor for leprosy, with an OR of 4.375.

Table 2
The Relationship between House Sanitation and Leprosy Incidence in the Guluk-Guluk Health Center Working Area Sumenep Regency

Variable	Leprosy Incident				p-value	OR (CI 95%, LL – UL)
	Case		Control			
	n1	%	n2	%		
Palate						
Not eligible	19	63.3	6	20	0.002	6,909 (2.16 – 22.098)
Qualify	11	36.7	24	80		
Floor						
Not eligible	14	46.7	5	16.7	0.026	4,375 (1.32 – 14.504)
Qualify	16	53.3	25	83.3		
Room Ventilation/Windows						
Not eligible	18	60	8	26.7	0.019	4,125 (1.387 – 12.27)
Qualify	12	40	22	73.3		
Temperature						
Not eligible	17	56.7	12	40	0.301	1,962 (0.702 – 5.479)
Qualify	13	43.3	18	60		
Humidity						
Not eligible	20	66.7	15	50	0.295	2,000 (0.705 – 5.677)
Qualify	10	33.3	15	50		
Home Sanitation						
Not eligible	19	63.3	5	20	0.001	8,636 (2,566 – 29,073)
Qualify	11	36.7	25	80		

The case group had 60% (18 people) of ventilation/room window conditions that did not meet the requirements, while the control group generally had 73.3% (22 people). The statistical test results show a p-value = 0.019, which means there is a relationship between ventilation/room windows and the incidence of leprosy. Room ventilation/windows are a risk factor for leprosy, with an OR of 4.125.

The majority of the case group, 56.7% (17 people), has a house with a temperature that does not meet the requirements, while the majority of the control group has a house with a temperature that meets the requirements, 60% (18 people). The statistical test results show a p-value = 0.301, which means there is no relationship between temperature and the incidence of leprosy. Temperature is a risk factor for leprosy, with an OR of 1.962.

The majority of the case group had houses with humidity conditions that did not meet the requirements, namely 66.7% (20 people), while half of the control group had houses with humidity conditions that met the requirements, 50% (15 people). The statistical test results show a p-value = 0.295, which means there is no relationship between humidity and the incidence of leprosy. Humidity is a risk factor for leprosy, with an OR of 2.000.

Most of the case group had house sanitation conditions that did not meet the requirements, amounting to 63.3% (19 people). In contrast, most of the control group had house sanitation conditions that met the criteria, amounting to 80% (25 people). The statistical test results show p-value = 0.001, which

means there is a relationship between home sanitation and the incidence of leprosy. House sanitation is a risk factor for leprosy, with an OR of 8.636.

Analysis of the relationship between personal hygiene and the incidence of leprosy in the Guluk-Guluk Health Center Working Area, Sumenep Regency, obtained the results listed in the table 3.

Table 3
Personal Hygiene Relationships in the Working Area of the Guluk-Guluk Health Center, Sumenep Regency

Variable	Leprosy Incident				p-value	OR (CI 95%, LL – UL)
	Case		Control			
	n	%	n	%		
Hand and Foot Hygiene						
Not good	16	53.3	7	23.3	0.034	3,755 (1,239 – 11,385)
Good	14	46.7	23	76.7		
Bed Cleanliness						
Not good	21	70	13	43.3	0.068	3,051 (1,053 – 8,839)
Good	9	30	17	56.7		
Personal hygiene						
Not good	17	56.7	6	20	0.008	5,231 (1,657 – 16,515)
Good	13	43.3	24	80		

Table 3 shows that most of the case group had poor hand and foot hygiene behavior, 53.3% (16 people), compared to the control group, most of whom had good hand and foot hygiene, 76.7% (23 people). The statistical test results show p-value =0.034, which means there is a relationship between hand and foot cleanliness and the incidence of leprosy. Hand and foot cleanliness is a risk factor for leprosy, with an OR of 3.755.

In terms of bed cleanliness, 70% of the case group was poor (21 people), while 56.7% (17 people) of the control group had good bed cleanliness. The statistical test results show a p-value of 0.068, which means there is no relationship between bed cleanliness and the incidence of leprosy. However, bed cleanliness is a risk factor for leprosy, with an OR of 3.051.

Most of the case group had poor personal hygiene, 56.7% (17 people), while most of the control group had good personal hygiene, 80% (24 people). The statistical test results show p value =0.008, which means there is a relationship between personal hygiene and the incidence of leprosy. Personal hygiene is a risk factor for leprosy with an OR of 5.231.

Discussion (required)

This research is in line with research conducted at the Talango Community Health Center, Sumenep Regency, which stated that there was a relationship between the condition of the house and the incidence of leprosy. Most of these houses rarely open their windows, have floors that are not watertight, and walls that do not meet the requirements [16]. M. Leprae can be found in water and soil. The type of house-building material will influence water infiltration and the amount of dust in the house so that the house's condition that meets the requirements prevents optimal conditions for leprosy bacteria [13].

In line with research at Sumberglagahh Mojokerto Regional Hospital, there is a relationship between house ceilings and the incidence of leprosy [17]. The ceiling functions to hold dust that falls

from the roof. The ceiling in the house must be clean because leprosy bacteria can be found in dust. Dust on the roof, if inhaled, can cause disease. The ceiling also retains rainwater seepage so that the house's condition is not humid and does not become a breeding ground for pathogenic microorganisms, especially leprosy bacteria [18]. A ceiling that meets requirements aims to ensure adequate air volume. Acceptable indoor air volume prevents the house from feeling damp because good air circulation helps remove CO₂ and body evaporation, thus preventing the proliferation of bacteria [19].

House cleanliness is essential in transmitting leprosy because floor dust can contain leprosy bacteria from the outside. This study aligns with research in Bima Regency, which showed a relationship between the type of floor and the incidence of leprosy [20]. Floors that are not waterproof can cause water to seep into the house, making the house damp. Floors made from damaged soil/plaster are difficult to clean with disinfectant or Lysol. This condition can lead to the development of leprosy bacteria [21].

According to research at the Muara Sabak Timur Community Health Center, there is a relationship between ventilation and the incidence of leprosy [22]. Inadequate ventilation causes humid conditions in the room due to insufficient O₂ entry. Ventilation also allows air to come in and out of the room. This air circulation will bring the leprosy bacteria inside the room out [23].

This research is in line with research in Bangkalan Regency, which means there is no relationship between temperature and the incidence of leprosy [24]. Leprosy bacteria grow optimally *in vivo* in mice at room temperature, which is around 27-30°C; this shows that leprosy germs can live in the temperature range that is considered comfortable according to government regulations. Leprosy bacteria can also live above 30°C outside the human body for up to 10 days [25].

In line with Pitoyo's (2023) research, there is no relationship between humidity and the incidence of leprosy [22]. High humidity levels can cause drying of the mucous membranes, thereby reducing their effectiveness in preventing the entry of microorganisms into the body [26]. Leprosy bacteria can survive outside the human body in different temperature and humidity conditions. At 43.7% humidity, this bacteria can survive for seven days. At 77% humidity, the bacteria can live for up to ten days. The higher the humidity in a room, the longer the bacteria will survive in that environment [25].

This research is in line with research in East Tanjung Jabung Regency, which means there is a relationship between personal hygiene and the incidence of leprosy [27]. Leprosy is transmitted through skin contact. A person can be infected with leprosy because leprosy bacteria can reach the skin's surface through hair follicles and sweat glands.

In line with research at the Manguharjo and Ngegong Community Health Centers, there is a relationship between the habit of washing hands and feet and the incidence of leprosy. Another study in Gondar found that washing hands without soap risks contracting leprosy. Washing hands without using soap only removes visible dirt, while disease-causing microorganisms are still attached to the surface of the hands [28], [29].

The hands are the body part that first comes into contact with the surrounding environment. Disease transmission occurs when pathogenic microorganisms are on the surface of the hands and can be transmitted through direct contact with other individuals or transfer to touched objects. The bacteria that cause leprosy penetrate the skin's surface through hair follicles and sweat glands, so individuals frequently come into contact with leprosy sufferers and are at risk of developing leprosy. Regular hand hygiene can reduce the number of pathogenic microorganisms on the hands and arms and reduce the risk of cross-contamination between individuals [30].

The use of footwear also prevents the transmission of leprosy. According to Budiarmo (1996), individuals who do not wear footwear cause their bare feet to rub against the ground, making them

susceptible to injury. This condition becomes the entry route for *M. Leprae* in the soil into the body [31]. In line with studies that found leprosy bacteria in soil, soil is likely to be a reservoir for leprosy [32].

This study aligns with research at the Waena Health Center, Jayapura City, which showed no relationship between changing bed sheets, pillowcases, and blankets and the incidence of leprosy [12]. Rarely drying and changing mattress sheets and blankets allows disease germs to grow and reproduce on the bed [33]. The bed sheet functions as a mattress cover and prevents the mattress from becoming damp. Beds and bed sheets are the areas that come into contact most often with room occupants, who usually spend a minimum of eight hours a day in that place, either sleeping or just resting [34]. Leprosy bacteria reach the skin's surface through follicles, hair, and sweat, so bacteria is likely transferred to bedding [35].

Conclusions

This research aims to analyze the relationship between home sanitation and personal hygiene and leprosy incidence. The results of the study show that home sanitation and personal hygiene are risk factors for the incidence of leprosy. The findings were that houses that do not meet the requirements can increase humidity, so they become an ideal place for leprosy bacteria. The majority of respondents have poor hand and foot cleanliness and bed cleanliness. It is essential to carry out PHBS counseling and further research to improve interventions to reduce the prevalence of leprosy in the Guluk-Guluk District.

Funding:

Not Applicable

Informed Consent Statement:

Informed consent was obtained from all respondents involved in this study

Conflicts of Interest:

The authors declare no conflicts of interest

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