Jurnal Berkala Epidemiologi
Volume 11 No 1. January 2023. 68 – 75
p-ISSN: 2301-7171; e-ISSN: 2541-092X
DOI: 10.20473/jbe.v11i12023.68–75
https://e-journal.unair.ac.id/JBE/
Email: jbe@fkm.unair.ac.id / jbepid@gmail.com

Jurnal Berkala
EPIDEMIOLOGI
PERIODIC EPIDEMIOLOGY JOURNAL

ORIGINAL ARTICLE

RISK FACTORS OF LEPROSY IN DAHA HUSADA GENERAL HOSPITAL, KEDIRI CITY

Faktor Risiko Kejadian Kusta di Rumah Sakit Umum Daha Husada Kota Kediri

Syahirul Alim[1], Chatarina Umbul Wahyuni[2], Diah Indriani[3]
[1]Department of Epidemiology, Biostatistics, Population and Health Promotion, Faculty of Public Health, Universitas Airlangga, 60115, Indonesia, syahirul.alim-2019@fkm.unair.ac.id
[2]Department of Epidemiology, Biostatistics, Population and Health Promotion, Faculty of Public Health, Universitas Airlangga, 60115, Indonesia, chatarina.uw@fkm.unair.ac.id
[3]Department of Epidemiology, Biostatistics, Population and Health Promotion, Faculty of Public Health, Universitas Airlangga, 60115, Indonesia, diah-i@fkm.unair.ac.id
Corresponding Author: Syahirul Alim, syahirul.alim-2019@fkm.unair.ac.id, Department of Epidemiology, Biostatistics, Population and Health Promotion, Faculty of Public Health, Universitas Airlangga, 60115, Indonesia

ARTICLE INFO

Article History:
Received August, 17th, 2021
Revised form June, 17th, 2022
Accepted December, 6th, 2022
Published online January, 29th, 2023

Keywords:
Age;
contact history;
educational status;
gender;
leprosy

Kata Kunci:
Usia;
riwayat kontak;
tingkat pendidikan;
jenis kelamin;
kejadian kusta;

ABSTRACT

Background: East Java Province is a province on the island of Java with a high incidence of leprosy. Daha Husada Kediri General Hospital is a hospital that provides health services to leprosy patients. **Objective**: To analyze the risk factors for leprosy in Daha Husada General Hospital, Kediri City. **Methods**: This study used a case-control research design to use an analytic observational method. The case group was patients diagnosed with leprosy and treated at Daha Husada General Hospital. In contrast, the control group was patients who were not diagnosed with leprosy and were treated at Daha Husada General Hospital. The variables used are age, education level, occupation, gender, and contact history. The number of respondents was 362 respondents divided into case and control groups, each of which was 181 people. Data collection is done through medical records. **Results**: The p-value for age 0.01<0.05 with OR 2.60 and 95% CI (1.64-4.14), the p-value for educational level (0.01)<0.05 with OR 2.99 and 95% CI (1.93-4.60), the p-value for sex (0.00)<0.05 with OR 0.43 and 95% CI (0.27-0.68), the p-value for history contact (0.01) <0.05 with OR 5.56 and 95% CI (2.51-12.31) which means that age, educational level, gender, contact history are related to leprosy. **Conclusion**: Age, education level, gender, and contact history determine the transmission of leprosy at Daha Husada General Hospital, Kediri.

ABSTRAK

Latar Belakang: *Sejak tahun 2015, penyakit kusta telah mengalami penurunan kasus. Namun hal ini tidak terjadi di Indonesia yang justru menemukan peningkatan kasus baru. Provinsi Jawa Timur adalah provinsi*

How to Cite: Alim, S., Wahyuni, C., U., & Indriani, D. (2023). Risk factors of leprosy in Daha Husada general hospital, Kediri city. *Jurnal Berkala Epidemiologi, 11(*1), 68-75. https://dx.doi.org/10.20473/jbe.11i1 2023. 68-75

di Pulau Jawa dengan insiden kusta yang tinggi. RSU Daha Husada Kediri merupakan rumah sakit yang menyediakan pelayanan kesehatan terhadap pasien kusta. ***Tujuan:*** *Menganalisis faktor risiko kejadian kusta di RSU Daha Husada Kota Kediri.* ***Metode:*** *Penelitian ini menerapkan metode observasional analitik menggunakan rancangan penelitian case control dengan matching. Variabel dalam penelitian ini yaitu usia, tingkat pendidikan, pekerjaan, jenis kelamin, dan riwayat kontak. Jumlah responden adalah 362 responden yang terbagi ke dalam kelompok kasus dan kontrol masing-masing 181 orang. Pengumpulan data dilakukan melalui rekam medis.* ***Hasil:*** *P-value usia 0,01 <0.05, p-value tingkat pendidikan (0,01) <sig (0,05), p-value jenis kelamin (0,00) <sig (0,05), p-value riwayat kontak (0,01) <sig (0,05) yang berarti bahwa usia, tingkat pendidikan, jenis kelamin, riwayat kontak berhubungan dengan kejadian kusta. OR responden dengan usia produktif berisiko 2,60 kali lebih besar terkena kusta. OR responden dengan tingkat pendidikan rendah berisiko 2,99 kali lebih besar terkena kusta. OR responden dengan jenis kelamin laki-laki berisiko 0,43 kali lebih besar terkena kusta. OR responden dengan riwayat kontak berisiko 5,56 kali lebih besar terkena kusta. P-value pekerjaan (0,34)>sig (0,05.* ***Kesimpulan:*** *Faktor yang berhubungan dengan kejadian kusta yaitu usia, tingkat pendidikan, jenis kelamin, riwayat kontak berhubungan dengan kejadian kusta di RSU Daha Husada Kediri.*

INTRODUCTION

Leprosy is a disease included in the Neglected Tropical Diseases (NTD) caused by Mycobacterium leprae (1). Leprosy attacks the nerves, skin, upper respiratory tract, and peripheral nerves, causing numbness. Leprosy is a chronic disease that rarely causes death but can cause disability (2). Disability caused by leprosy is considered by society as a hereditary disease associated with dirty blood, so leprosy patients are often ostracized by most of society (3). Leprosy, or what is usually called Morbus Hansen's disease, can affect all ages, from children to the elderly, so it is not surprising that leprosy can be found easily in Indonesia (4). Based on data from the World Health Organization (WHO) in Table 1, it is stated that the incidence of leprosy in the world in 2019 is still relatively high; 202,226 patients were found. WHO also explained that as many as 14 countries contributed to the addition of leprosy cases, which amounted to 94% of all cases worldwide (1).

Indonesia, a country in Southeast Asia, was reported to have the third-highest number of leprosy cases worldwide. India and Brazil 2019 reported there are 17,439 new cases of leprosy in 2019. Based on the 2020 Indonesia Health Profile presented in Figure 1, the number of new cases of leprosy and the prevalence of leprosy fluctuates actively. The lowest number of new cases of leprosy occurred in 2017, with findings of 0.70 new cases per 10,000 population with a prevalence of 6.08 per 10,000 population. The incidence and prevalence of leprosy increased again in 2018, with an incidence of 0.7 per 100,000 population and a prevalence of 6.42 per 10,000 population. The finding of new cases increased the following year, namely 0.74 per 100,000 population, and the prevalence increased to 6.51 per 10,000 population. It can be seen that new cases and the number of leprosy cases are increasing; this indicates that the cure rate is low because every year, cases of leprosy do not decrease but increase.

Table 1
Leprosy Case Number According to Regional WHO in 2019

Regional	Number of Cases	%
Africa	20,207	9.91
America	29,935	14.83
East Mediterranean	4,271	2.10
Europe	42	0.02
Southeast Asia	143,787	71
West Pacific	3,894	1.92
Global	202,226	100

Source: *World Health Organization*

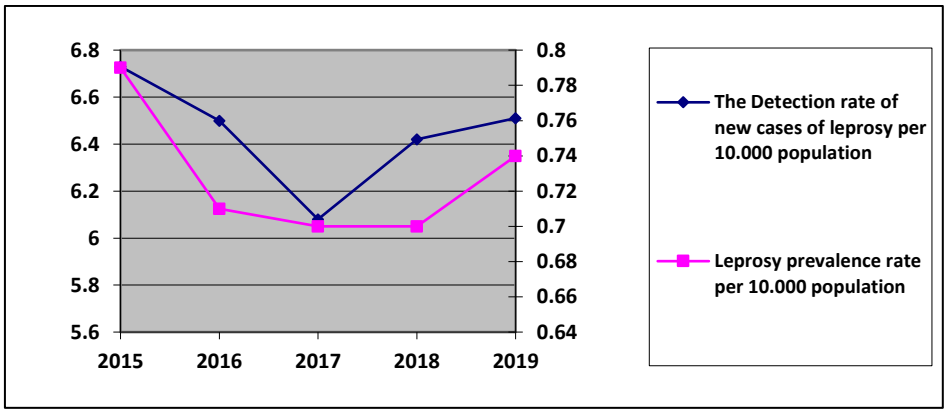

Figure 1. The trend of finding new cases of Leprosy in Indonesia in 2015-2019
Source: Indonesian Health Profile, 2019

East Java Province is the province that contributes the most cases of leprosy, with 2,705 cases in 2019 (5). East Java Province is densely populated and the fifth most populous city in Indonesia (6). The high population density in East Java Province can lead to easy transmission of leprosy in community areas (7).

Leprosy is transmitted through leprosy bacilli found in many places such as soil, water, and air, and leprosy sufferers. When the patient coughs or sneezes, the bacteria in the droplets are carried by the wind to another place and will last for seven days (8). During that time, the bacteria will infect individuals who inhale it. Several risk factors for leprosy transmission include household contact with leprosy sufferers, neighbor contacts, environmental hygiene, personal hygiene, community knowledge, gender, BCG vaccination status, and socio-economic status (9). One of the risk factors for leprosy is a history of contact in one area or house (10). Contact history can result from high levels of occupancy density, which can increase the likelihood of intense contact between residents and patients. Intense close contact over a long time can increase the risk of transmission (11). The transmission occurs through the process of inhalation, skin contact, as well as the process of blood transfusions, and organ transplants (12).

The research by Putri et al (13) shows that relationship between the history of household contact and leprosy shows a negative correlation that someone who has a history of household contact with leprosy sufferers does not all suffer from leprosy. But other research stated that contact history was related to the incidence of leprosy cases (14). Based on the results of research conducted by previous researchers, there are differences in results, so this research is essential to do. This study aimed to analyze the risk factors for leprosy at Daha Husada Hospital, Kediri, in 2019.

METHODS

This study applies an analytic observational method using a case-control research design. This study uses data for 2019, namely in January - December at the Daha Husada General Hospital, Kediri City. This research was conducted in September 2021. The population in this study were all leprosy patients at Daha Husada General Hospital in 2019 totaling 591 patients. Sampling was carried out using Simple random sampling. The sample size was calculated using the Lemeshow formula (1990) because the target population was too large and the numbers varied.

The formula is as follows:

$$n = \frac{\left(z_{1-\alpha/2}\sqrt{2P_2^*(1-P_2^*)} + z_{1-\beta}\sqrt{P_1^*(1-P_1^*) + P_2^*(1-P_2^*)}\right)^2}{\left(P_1^* - P_2^*\right)^2}$$

where:
n = minimum sample size
$Z_{1-\alpha/2}$ = standard average distribution value (Table Z) at a certain α
$Z_{1-\beta}$ = value of the standard normal distribution (table Z) at a specific β
P_1* = estimated probability of exposure in population 1 (outcome +)
P_2* = estimated probability of exposure in population 2 (outcome)

This study divided the research sample into two categories, namely cases and controls, with a ratio of 1:1. The number of respondents in this study was 181 case groups and 181 control groups.

The data used in this research is secondary data from Daha Husada Public Hospital. Method of data collection by conducting a study of patient medical records according to the inclusion and exclusion criteria. The research instrument used a data collection sheet. This study identified a description of the characteristics of the respondents, which were divided into case and control groups based on age which was divided into two categories, namely the productive age group (15-64 years), and the non-productive age group (<15 and 65≥ years). The jobs in this study are divided into two categories, namely high-risk (farmers, laborers, and workshop workers) and low-risk (jobs requiring a senior high school diploma or higher) (not working, students, office workers). Gender with female and male categories, and contact history with contact and non-contact categories. This study analyzes the relationship between the independent and dependent variables using the chi-square test and analyzes the Odds Ratio value.

This study uses the epidemiological triangle theory in analyzing the incidence of leprosy, which illustrates that it affects the balance between the host, agent, and environment. Based on host factors including age, gender, occupation, and contact history. The agent factor discusses the bacterium Mycobacterium leprae, which infects humans and can cause leprosy. Environmental factors, namely environmental conditions, can increase the risk of contracting leprosy. An environment with fairly dense occupants can facilitate the transmission of leprosy. Based on theoretical studies, this study discusses host factors, namely age, occupation, education level, gender, and contact history, which are associated with leprosy.

This study's independent variables are age, education level, occupation, gender, and prior contacts. The dependent variable in this study is the frequency of leprosy cases. The case and control groups' inclusion criteria for this study were divided into two categories. Patients who visited the Daha Husada Hospital in Kediri with leprosy diagnoses met the criteria for case inclusion. Patients who visited Daha Husada Kediri Public Hospital but did not have leprosy met the inclusion criteria for the control group. Patients who refused to participate in the study and those who had decreased consciousness or were physically weak met the only criteria.

This research received ethical approval from the Kadiri University research ethics commission with Number 010/30/VIII/EC/KEP/UNIK/2021 in August 2021.

RESULTS

Based on Table 2, out of 362 respondents, there were 181 cases and 181 controls. Most of the respondents belonged to the productive age group, had a low level of education, were workers, were male, and had a history of contact with lepers. In the age variable, it is known that in the case and control groups, leprosy affects more humans in the productive age group with successive percentages (79.01%). Based on the cross-tabulation results, it is known that the age group is significantly related to the incidence of leprosy at Daha Husada General Hospital in 2019 with a p-value of 0.00 and OR 2.60 (1.64 – 4.14) with OR> 1, which indicates that respondents in the productive age group are at risk of contracting leprosy 2.60 times greater than the respondents in the unproductive group.

Most of the respondents in the case group had a low level of education (70.72%), while in the control group, most had a high level of education (55.25%). Based on the cross-tabulation results, it is known that education level is significantly related to the incidence of leprosy at Daha Husada Kediri Public Hospital in 2019, with a p-value of 0.00 and OR 2.99 (1.93–4.60) with OR> 1. This result means that respondents with a low level of education have a 2.99 times greater risk of contracting leprosy than respondents with a high level of education.

Regarding occupational variables, in the case group, most respondents had high-risk livelihoods (54.70%). More than half of the respondents in the control group have jobs with low risk (50.28%). Based on the results of cross-tabulation, it stated that work is related to the incidence of leprosy with a p-value of 0.01, but it is known that the OR is 0.19 (0.12 – 0.30), namely OR <1, this means that male respondents are not too at risk of contracting leprosy.

The majority of respondents in the case and control groups were male, with successive percentages (79.56%) and (62.43%). Based on the cross-tabulation results, it is known that the p-value is 0.01, so it can be concluded that there is a relationship between gender and the incidence of leprosy. Men have a greater risk of getting leprosy than women.

In the contact history variable, it is known that more respondents did not have contact with

leprosy patients, namely 317 respondents, compared to the number of respondents who had contact history, namely 45 respondents. Table 2 shows that of the 181 respondents in the case group, 20.44% of respondents had a history of contact and were affected by leprosy. In contrast, 4.42% of respondents had a history of contact but were not infected with leprosy. The cross-tabulation results show that contact history has a significant relationship with the incidence of leprosy at Daha Husada Kediri General Hospital in 2019, with a p-value of 0.01 and OR 5.56 (2.51 – 12.31). Respondents with a history of contact with sufferers are 5.56 times more likely to be affected by leprosy compared to respondents who did not have a history of contact with lepers.

DISCUSSION

Age Relationship with Leprosy Incidence

Leprosy is a disease that occurs due to age. Leprosy is a type of chronic disease, namely a disease with a long latency period. This long latency period makes the prevalence of leprosy at a young age tend to be small (15). Leprosy has an incubation period of 2-5 years from when a person becomes infected. This situation also causes the discovery of leprosy in adults (16).

The study's results stated that age had a significant relationship with the incidence of leprosy. The results of this study are not in line with research conducted by Meryen and Parlaungan (17), which stated that there was no relationship between age and the incidence of leprosy. This study differs from existing research because it uses a more significant number of samples, so the age data distribution between the case and control groups is the same.

The results of this study are also proven by the value of the correlation coefficient between age and the incidence of leprosy at Daha Husada General Hospital, which has a strong relationship in the weak category because the correlation number is close to one (0.22). Furthermore, based on the direction, age and the incidence of leprosy have a unidirectional relationship, meaning that with increasing age, there is an increase in the incidence of leprosy. Based on Table 2, most lepers are people in the productive age group (15-64 years). This situation occurs due to the long incubation period of leprosy, so leprosy can be identified after the incubation period, which is 2-5 years after infection.

Table 2
Cross Tabulation of Contact History with Leprosy Incidence at Daha Husada Kediri General Hospital in 2019

Variable	Leprosy incidence				OR 95% CI	*p-value*	*Correlation*
	Case		Control				
	n	%	n	%			
Age (Year)							
Productive (15 – 64)	143	79.01	107	59.12	2.60	0.01	0.22
Non-Productive (>15 and 65≤)	38	20.99	74	40.88	(1.64 – 4.14)		
Education							
Low (≤Junior High School)	128	70.72	81	44.75	2.99 (1.93 – 4.60)	0.01	0.26
High (≥Senior High School)	53	29.28	100	55.25			
Occupation							
High Risk	99	54.70	90	49.72	1.22 (0.81 – 1.85)	0.34	-3.81
Low Risk	82	45.30	91	50.28			
Gender							
Male	144	79.56	113	62.43	2.34 (1.46 – 3.75)	0.01	0,19
Female	37	20.44	68	37.57			
Contact History							
Contacted	37	20.44	8	4.42	5.56	0.01	0,24
Not contacted	144	79.56	173	95.58	(2.51–12.31)		
Total	181	100.00	181	100.00			

Source: Daha Husada General Hospital Kediri, 2019

Relationship between Education Level and Leprosy Incidence

Most cases of leprosy have a low level of education. A low level of education can cause delays in the treatment process because people with low levels feel reluctant to carry out examinations. It can increase the risk of disability in leprosy (18). This low treatment rate is evidenced by the fact that most of leprosy patients come to the hospital through the referral system, indicating that leprosy sufferers do not understand leprosy.

This research is not in line with research conducted by Maryen and Parlaungan's (17) research, which states that there is no relationship between education level and the incidence of leprosy. The difference between the results of this study and research conducted by Maryen and Parlaungan lies in the number of samples. Maryen's study used a total sample of 27 case groups and 27 control groups. This study used 181 respondents in the case and control groups. Leprosy is a chronic infection that causes blemishes and inflammation on the skin. This type of NTD (Neglected Tropical Disease) can be transmitted to other people who contact leprosy patients through inhalation and skin contact..

Leprosy can also be transmitted through blood transfusion (12). The contact process between patients and families that is intense and for an extended period can increase the risk of transmission. Social contacts with the general public, such as neighbors and the wider community, also pose a risk of transmission, even though the risk is low (19). Leprosy transmission occurs through the respiratory tract in individuals exposed to droplets (saliva or sputum) that come out when the patient coughs or sneezes (20).

Low education severely impacts employment, health, and people's welfare. The importance of knowledge of leprosy is to increase awareness so that people do early detection before disability occurs. The importance of education and outreach to the community, especially to people with low levels of education regarding leprosy and its prevention, is essential (3). However, even though the results of the relationship indicate a significant relationship, the strength of the relationship between education level and the incidence of leprosy is relatively weak (0.26) in a positive direction. It means that leprosy does not look at a person's level of education.

Occupational Relations with Leprosy Incidence

The results of the cross-tabulation stated that there was no relationship between work and the incidence of leprosy. This study's results align with Maryen and Parlaungan (17), which stated that there was no relationship between work and the incidence of leprosy. There is no relationship between work and the incidence of leprosy in this study because most lepers are office workers. Jobs with a high risk of leprosy are menial jobs without tools, better known as manuals, such as farmers.

Gender Relationship with Leprosy Incidence

Leprosy can affect everyone, both in groups of men and women (21). Based on Table 2, it is stated that the majority of lepers are male. This incident can occur due to environmental factors or personal hygiene factors. Based on the results of the Spearman correlation, it is known that although there is a relationship between gender and the incidence of leprosy, it has a robust and weak relationship (0.18) with a positive relationship, which means that the more people who are male, the more the incidence of leprosy. The low incidence of leprosy in the women's group can be caused by lifestyle and environmental factors; namely, women tend to take care of themselves and maintain their health (22).

Relationship of Contact History with Leprosy Incidence

The study results showing that contact history is associated with the incidence of leprosy at Daha Husada Kediri General Hospital in 2019 align with existing research. However, even though it has a significant relationship, the relationship between contact history and leprosy has a shallow strength (0.24) with a positive relationship. It means that the more people with a history of contact, the higher the incidence of leprosy.

Transmission of leprosy caused by a history of contact is caused by the level of public education, which tends to be low. This level of education is related to the public's knowledge of something, including leprosy. The lack of knowledge and education about leprosy in the community can make sufferers withdraw and not get treatment so that sufferers can freely transmit leprosy to family members and other closest people (23). It causes the incidence of leprosy in Indonesia to be high every year so that it becomes the third highest country in the world as a country that contributes the most to leprosy. The current society's stigma that tends to be hostile towards leprosy is also

relatively high. It makes leprosy a complex problem because it also has an impact on economic factors as well as social and cultural factors. Leprosy sufferers are still considered a curse and difficult for society to accept even though the disease has been declared cured (24).

Leprosy Overcoming Support

Based on the research results, support for leprosy prevention is needed, especially from a promotive point of view, to increase public knowledge about the definition of leprosy, the ways of transmission of leprosy, and the risk factors for leprosy transmission. Furthermore, although the research results stated that most of the variables had a relationship with the incidence of leprosy, this relationship had a robust and weak relationship. However, with this research, knowledge can be added to leprosy management so that people remain vigilant about living with leprosy patients.

Research Limitations

Based on the study's results, it was stated that most variables had a relationship with the incidence of leprosy, but this relationship had a robust and weak relationship. It is the basis that research is still needed on the dominant risk factors for leprosy, which are the direct cause of transmission or occurrence of leprosy.

CONCLUSION

Based on the study results, age, education level, gender, and contact history were significantly related to the incidence of leprosy at Daha Husada Kediri Hospital in 2019 but had a strong and weak relationship with a positive relationship. Communities with a history of contact must be aware of leprosy transmission even though leprosy has a low and chronic transmission rate. There is still a risk of transmission if the patient and the surrounding community do not apply prevention, one of which is by implementing PHBS. The importance of education and socialization to the public, especially to people with low levels of education about leprosy and early detection efforts, so that public awareness about leprosy prevention increases and the community does not feel ostracized or embarrassed to take treatment, especially for leprosy sufferers.

CONFLICT OF INTEREST

The researcher stated that there was no conflict of interest in this research.

AUTHOR CONTRIBUTION

Each author contributed to the writing of this article. SA contributes to the article's content, namely the introduction, method, results, and discussion. CUW contributed to the writing of the introduction, discussion, and conclusion. DI contributed to the article’s concepts, methods, and data statistics.

REFERENCES

1. WHO. Leprosy [Internet]. 2022. Available from: https://www.who.int/news-room/fact-sheets/detail/leprosy
2. Nurzila U, Adriyani R. The effect of contact history and immunization status on the new case of leprosy. J Berk Epidemiol [Internet]. 2019 Aug 30;7(2):112–9. Available from: https://e-journal.unair.ac.id/JBE/article/view/10645
3. Tosepu R, Gunawan J, Effendy DS, Fadmi FR. Stigma and increase of leprosy cases in SouthEast Sulawesi Province, Indonesia. Afr Health Sci. 2018;18(1):29–31.
4. Suparno AS, Tosepu R, Effendy DS. Leprosy cases in South Konawe regency based on surveillance data of the South Konawe regency health office, Southeast Sulawesi province, Indonesia. KnE Life Sci. 2022;72–7.
5. Kementerian Kesehatan Republik Indonesia. Profil kesehatan Indonesia tahun 2019. Jakarta: Kementerian Kesehatan RI; 2020. 497 p.
6. Badan Pusat Statistik. Kepadatan penduduk menurut provinsi (jiwa/km2). Badan Pusat Statistik. 2019. p. 3.
7. Prakoeswa FRS, Ilhami AZ, Luthfia R, Putri AS, Soebono H, Husada D, et al. Correlation analysis between household hygiene and sanitation and nutritional status and female leprosy in Gresik regency. Dermatol Res Pract. 2020;2020.
8. Siswanti, Wijayanti Y. Faktor risiko lingkungan kejadian kusta. Higeia(Journal Public Heal Res Dev. 2018;2(3):352–62.
9. Zuhdan E, Kabulrachman K, Hadisaputro S. Faktor-faktor yang mempengaruhi

kejadian kusta pasca kemoprofilaksis (studi pada kontak penderita kusta di Kabupaten Sampang). J Epidemiol Kesehat Komunitas. 2017;2(2):89.
10. Quilter EE V, Butlin CR, Singh S, Alam K, Lockwood DNJ. Patients with skin smear positive leprosy in Bangladesh are the main risk factor for leprosy development: 21-year follow-up in the household contact study (COCOA). PLoS Negl Trop Dis. 2020;14(10):e0008687.
11. Wahyuni IN, Haidah N, Winarko. Hubungan kondisi fisik rumah dan riwayat kontak penderita kaitannya dengan kejadian Kusta. Sulolipu. 2021;21(1):97–103.
12. Darmawan H, Rusmawardiana. Sumber dan cara penularan Mycobacterium Leprae. Tatumanegara Med J. 2020;2(2):390–401.
13. Putri LIR, Ahmad HAR, Nenden LS. Relationship between history of household contact and rate of leprosy in Central Jakarta area in 2017. 2019;
14. Akbar H. Faktor risiko kejadian kusta di wilayah kerja puskesmas Juntinyuat. J Wiyata. 2020;7(1):37–47.
15. Arifin IF, Prakoeswa FRS, Prakoswa CRS, Santoso KH, Utomo B, Mahmudiono T, et al. Nutrition as a risk factor of child leprosy in Gresik district 2019. J Berk Epidemiol. 2022;10(1):86–94.
16. Wangara F, Kipruto H, Ngesa O, Kayima J, Masini E, Sitienei J, et al. The spatial epidemiology of leprosy in Kenya: A retrospective study. PLoS Negl Trop Dis. 2019;13(4):e0007329.
17. Maryen Y, Parlaungan J. Faktor resiko kejadian kusta pada anak usia 5 – 14 tahun di Kota Sorong Papua Barat. Nurs Arts. 2018;11(1):23–42.
18. Salju E V, Muntasir, Rulianti LP. Studi faktor-faktor yang berhubungan dengan kejadian penyakit kusta pada wilayah kerja Puskesmas Bakunase Kota Kupang tahun 2017. J Info Kesehat. 2018;16(2):197–213.
19. Hambridge T, Nanjan Chandran SL, Geluk A, Saunderson P, Richardus JH. Mycobacterium leprae transmission characteristics during the declining stages of leprosy incidence: A systematic review. PLoS Negl Trop Dis. 2021;15(5):e0009436.
20. Ploemacher T, Faber WR, Menke H, Rutten V, Pieters T. Reservoirs and transmission routes of leprosy; A systematic review. PLoS Negl Trop Dis. 2020;14(4):e0008276.
21. van Dorst MMAR, van Netten WJ, Waltz MM, Pandey BD, Choudhary R, van Brakel WH. Depression and mental wellbeing in people affected by leprosy in southern Nepal. Glob Health Action. 2020;13(1):1815275.
22. Nasir A, Yusuf A, Listiawan MY, Harianto S, Huda N. Adaptive strategy of women's leprosy in Indonesia psychic experience of women with leprosy in living a community life. Syst Rev Pharm. 2020;11(10).
23. Anwar N, Syahrul S. Pengaruh stigma masyarakat terhadap perilaku pasien kusta dalam mencari pengobatan: Sebuah tinjauan sistematis. J Ners dan Kebidanan (Journal Ners Midwifery). 2019;6(2):172–80.
24. Singh R, Singh B, Mahato S. Community knowledge, attitude, and perceived stigma of leprosy amongst community members living in Dhanusha and Parsa districts of Southern Central Nepal. PLoS Negl Trop Dis. 2019;13(1):e0007075.