Journal of Midwifery and Nursing, 8 (1) (2026) pp. 33-26

Published by: IOCSCIENCE

Journal of Midwifery and Nursing

Journal homepage: www.iocscience.org/ejournal/index.php/JMN

Leptospirosis awareness and health service access in Coastal Demak

Fatati Larasati

Department of Health Informatics, Faculty of Health, Science, and Psychology, Universitas Sunan Gresik, Indonesia

ARTICLE INFO

Article history:

Received Dec 24, 2025
Revised Dec 30, 2025
Accepted Jan 12, 2026

Keywords:

Cross-Sectional Study;
Descriptive Study;
Health Service Access;
Knowledge;
Leptospirosis.

ABSTRACT

Leptospirosis is a zoonotic disease that remains a significant public health problem in Indonesia. Community knowledge about Leptospirosis and their health service access patterns play an important role in prevention and case management. This study aims to describe the level of knowledge about leptospirosis and the health service access chosen when experiencing illness in Bonang, Demak. A descriptive cross-sectional study was conducted among households in Bonang District. From eight villages with the highest leptospirosis incidence, 96 households were selected using cluster probability sampling. In this study, awareness is operationally defined as the level of knowledge about leptospirosis. Data were collected through a structured questionnaire on leptospirosis knowledge and health service access, and analyzed descriptively to present the distribution of knowledge and health service access. Most respondents had moderate level knowledge of leptospirosis, the majority of respondents understood the definition of leptospirosis but lacked knowledge regarding specific causes, symptoms, and the fact that leptospirosis is not transmitted between humans. In terms of health service access, the majority of respondents preferred practicing doctors as their first point of care. Community knowledge of leptospirosis remains insufficient and requires improvement through more intensive health education. Strengthening the primary health care access system is also necessary to ensure timely and effective case management.

Corresponding Author:

Fatati Larasati,
Department of of Health Informatics,
Universitas Sunan Gresik,
Jl. Kyai H. Syafi'I No.15 Dahanrejo, Gresik, 61124, Indonesia
Email: fatatilarasati@lecturer.usg.ac.id

1. Introduction

Leptospirosis is a zoonotic disease that continues to pose a public health challenge in Indonesia. It is caused by Leptospira bacteria transmitted through contact with urine or blood of infected animals, particularly rodents, and can present with clinical symptoms ranging from mild to severe (ILMA et al., 2022). Indonesia ranks third globally in leptospirosis mortality, with a case fatality rate (CFR) of 16.7%, following Uruguay (100%) and India (21%) (Artus et al., 2022). The CFR in Indonesia ranges between 2.5%–16.45%, with an average of 7.1%, and may reach 56% among patients aged 50 years and above. Severe cases are often associated with liver damage, indicated by jaundice, which increases mortality risk to 3–54% depending on organ involvement (Ginting & Indarjo, 2022).

Demak is one of the regions that consistently reports leptospirosis cases with fatalities occurring almost every year across 12 districts. The incidence of leptospirosis in Demak Regency over the past three years has remained relatively high, despite a temporary decline in 2021. In 2020, there were

108 reported cases of leptospirosis with a *Case Fatality Rate* (CFR) of 12.96%. In 2021, the number of cases decreased to 28, although the CFR rose to 17.86%. by 2022, the number of cases increased again to 42, with a CFR of 30.9% (Badan Pusat Statistik Kab. Demak, 2022). Bonang District continues to be the area with the highest number of leptospirosis cases in 2022, recording a total of 8 cases and 3 deaths (Badan Pusat Statistik Kab. Demak, 2023).

Indonesia is a country with a relatively high incidence of leptospirosis, particularly in coastal areas and areas with inadequate environmental sanitation. The geographical location of Bonang District, situated near the coast of the Java Sea and at the upstream area of the river, often results in residential settlements being inundated by tidal flooding or continuous rainfall. Consequently, the population in Bonang District is at a considerably higher risk of contracting leptospirosis compared to other areas in Demak Regency (Badan Pusat Statistik Kab. Demak, 2023). Environmental factors such as flooding, stagnant water, and risky community behavior increase the likelihood of transmission (Widodo & Edison, 2025). Environmental factors such as flooding, stagnant water, and poor sanitation contribute significantly to transmission. Human behavior, particularly knowledge and preventive practices, plays a critical role in disease severity and spread. Low levels of knowledge delay recognition of symptoms and medical care, while effective utilization of health facilities enables early detection and treatment, reducing morbidity and mortality (Widodo & Edison, 2025).

Leptospirosis can lead to death within two days to four weeks after infection if not promptly treated. This is generally attributed to patients' limited knowledge of the disease, as its symptoms often resemble those of common fever or influenza. Consequently, access to healthcare services is closely associated with mortality rates in leptospirosis cases. Patients who receive early treatment have a significantly better prognosis compared to those who seek medical care at a later stage. Previous studies have shown that low awareness is associated with high incidence in endemic areas (ILMA et al., 2022). In this study, awareness is operationally defined as the level of knowledge possessed by the community regarding leptospirosis. Some localized studies (Djafar & Manyullei, 2025) in Gorontalo; (Wulandari et al., 2024) in Surabaya examined knowledge gaps, but these were not conducted in coastal, high-incidence areas like Demak.

Research in Cilacap (Trapsilowati et al., 2021) linked poor knowledge to rising cases, but did not assess service access patterns. Study by Firdaus show that emphasized that community education and health promotion are crucial in improving knowledge, especially in coastal regions (Firdaus et al., 2025). However, limited research has specifically examined knowledge levels and health service access in relation to leptospirosis incidence in Bonang, Demak. This study therefore aims to 1) Describe community knowledge levels about leptospirosis, 2) Describe the incidence of leptospirosis in relation to knowledge levels, 3) 3) Describe patterns of health service access among households in this coastal area, and (4) Explore the relationship between knowledge, health service access, and clinical outcomes, with the aim of providing evidence for targeted interventions to reduce leptospirosis morbidity and mortality.

2. Method

This study was descriptive quantitative with cross-sectional design to describe the level of community knowledge regarding leptospirosis and their health service access patterns in Bonang District. The population of the study consisted of all households residing in Bonang District. The sample was drawn from areas with the highest incidence of leptospirosis, covering 8 villages in Bonang District. 5 villages were located in the working area of Bonang I Primary Health Center (Gebang, Purworejo, Tridonorejo, Morodemak, and Tlogoboyo), while three villages were located in the working area of Bonang II Primary Health Center (Bonangrejo, Poncoharjo, and Jatimulyo). This approach ensured that our study focused on communities most at risk, where knowledge gaps and health service access patterns are most critical for disease prevention and control.

A total of 96 households were included in the sample. Sampling was conducted using a probability sampling method with the cluster sampling technique, in which villages with the highest leptospirosis cases were designated as clusters, and households within these clusters were selected

randomly. Data collection was carried out using a structured questionnaire that assessed respondents' knowledge of leptospirosis (risk factors, clinical symptoms, and prevention) as well as their preferred health service access when experiencing illness. Analysis of data used univariate analysis and showed by frequency's table and diagram.

3. Result and Analysis

The research results obtained from 96 respondents can be seen in the following table:

Table 1.
Distribution of Characteristic's Respondents in Bonang District, Demak

	Characteristics	Frequency (n = 96)	Percentage (%)
Age	≥ 45	23	24
	< 45	73	76
Sex	Male	48	50
	Female	48	50
Level of Education	Rendah (≤ SMP)	76	79
	Tinggi (≥ SMA)	20	21
Job	Work	60	63
	Does not Work	36	37
Family Income	≤ UMK	72	75
	> UMK	24	25
History of Illness	Yes	8	8
	No	88	92

Most respondents (76%) were under 45 years old and mostly in the age range of 25-34 years old, evenly distributed by sex. The majority had junior high school education, worked as traders, farmers, or fishermen, and earned below the regional minimum wage (Rp 2.680.421,-). The majority of respondents had no history of illness (comorbidities). Table 2 below show that 22% respondent had a leptospirosis.

Table 2.
Distribution of Leptospirosis Incidents in Bonang District, Demak

	Characteristics	Frequency (n = 96)	Percentage (%)
Leptospirosis	Yes	21	22
	No	75	78

This study divided respondent's knowledge levels regarding leptospirosis and its prevention into three general categories: high, moderate, and low. These categories were derived from respondent's answers to 15 questions posed by the researchers. The following is a general distribution of respondent's knowledge levels regarding leptospirosis:

Table 3.
Distribution of Respondents' Knowledge about Leptospirosis

Knowledge levels about leptospirosis	Leptospirosis				Sum	
	Yes		No			
	n	%	n	%	n	%
Low (<56%)	14	41,2	20	58,8	34	100
Moderate (56% - 75%)	5	11,1	40	88,9	45	100
High (>75%)	2	11,8	15	88,2	17	100

The findings presented in Table 3. indicate that the majority of residents in Bonang District possess a moderate level of knowledge regarding leptospirosis. Furthermore, most individuals affected by leptospirosis are those with a low level of knowledge about the disease. The distribution of respondent's answers illustrates the extent to which they are informed or uninformed about leptospirosis and its prevention. The complete distribution of correct responses is presented as follows:

Table 4.
Distribution of Frequency of Correct Answer about Leptospirosis

Question	Frequency of Correct Answer	Percentage (%)
Definition of Leptospirosis	68	70,8
Cause of Leptospirosis		
a. bacteria of the genus Leptospira	48	50
b. Not by Fungi	43	44,8
Leptospirosis occur during Floods	73	76
Modes of Transmission Leptospirosis	46	47,9
Clinical Symptoms of Leptospirosis		
a. Headache	55	57,3
b. Muscle Pain	48	50
Leptospirosis transmitted from person to person	36	37,5
Leptospirosis does resolve spontaneously without treatment	41	42,7
Delayed access to healthcare services worsens the condition of Leptospirosis	84	87,5
Prevention of Leptospirosis		
a. Wearing protective footwear	41	42,7
b. Covering Food	51	53,1
c. Bathing with clean water	67	69,8
Open or scattered garbage disposal sites can contribute to the occurrence of leptospirosis.	69	71,9
Residential areas located near rice fields, rivers, or traditional markets are at higher risk of leptospirosis infection	56	58,3

The information derived from Table 4 reveals that the majority of respondents are familiar with the definition of leptospirosis as well as several preventive measures related to personal hygiene, such as covering food, bathing with clean water, and wearing footwear. This knowledge reflects a basic level of public awareness regarding this hazardous zoonotic disease. However, most respondents still lack understanding of the causes of leptospirosis, specific symptoms such as muscle pain, and the transmission mechanism through wounds exposed to water contaminated with *Leptospira* bacteria. In addition, misconceptions persist, particularly the belief that leptospirosis can be transmitted from person to person, whereas transmission occurs solely through contact with contaminated environments. The finding that most respondents possessed moderate knowledge, yet leptospirosis cases were concentrated among those with low knowledge, underscores the protective role of awareness in disease prevention. Moderate knowledge alone appears insufficient, as gaps in understanding of causes, symptoms, and transmission persist. This highlights the need for targeted health education interventions focusing on low-literacy households, coupled with improved access to primary healthcare services, to reduce vulnerability and strengthen early detection of leptospirosis.

Health service access can be identified from the initial actions taken by respondents when experiencing illness or discomfort. This access is categorized into two groups: the first group consists of individuals who do not seek formal health facilities when initially ill, including those who take no action, practice self-medication, pursue traditional treatments (such as consulting a shaman), or purchase medicine from local shops or pharmacies. The second group comprises individuals who seek formal health facilities when initially ill, including those who visit modern healthcare providers such as primary health centers, hospitals, government or private health facilities, as well as private medical practitioners. The distribution of health service access is presented as follows:

Table 5.
Health Service Access Distribution

Characteristics	Frequency (n = 96)	Percentage (%)
Do Nothing	8	8
Self Medicate	0	0

Characteristics	Frequency (n = 96)	Percentage (%)
Searching Alternative Medicine	0	0
Buy Medicine to Pharmacy or Market	30	31
Go to Public Health Center	19	20
Go to Practicing Doctors	39	41
Total	96	100

Health service access, as presented in Table 5, demonstrates that the majority of respondents, when experiencing illness or discomfort, chose to seek treatment from private medical practitioners or midwives. Interviews revealed that the primary reasons for choosing these providers were their proximity to respondents' homes and the shorter waiting times. However, among respondents diagnosed with leptospirosis, the majority preferred to purchase medicine from local shops or pharmacies. This preference was based on the perception that their illness would resolve quickly with over-the-counter medication. Only when symptoms persisted for two to three days after consuming such medication did respondents decide to seek formal healthcare services.

The ease of access to healthcare services can also be assessed by examining the distance between respondents' residences and healthcare facilities such as primary health centers. The distribution of respondents' residential distance to the nearest Primary helath center is presented as follows:

Table 6.
Distribution of Distance Recidence from Primary Health Center

Distance Recidence from Primary Health Center	Leptospirosis				Sum	
	Yes		No			
	n	%	n	%	n	%
Far	8	18,2	36	81,8	44	100
Near	13	25	39	75	52	100

The information obtained from Table 6. indicates that the majority of respondents' residences are located in close proximity to primary health centers. Even though the primary health center is close, the midwife is closer to home and there is no need to queue. Preferences for doctors/midwives and pharmacies reflect a combination of accessibility, convenience, cost, and perceptions of illness severity. While these choices meet immediate needs, they contribute to delayed diagnosis and treatment of leptospirosis, underscoring the need for health education and improved service delivery at primary health centers.

Analysis

Level of Knowledge on Leptospirosis

Educational attainment significantly influences the breadth of knowledge possessed by the community. In this study, the majority of respondents had completed junior high school, whereas most leptospirosis patients were elementary school graduates (38%). Education is important to change our behaviour, Study by Djafar in Gorontalo show there are strong correlation between health literacy and perceptions toward leptospirosis (Djafar & Manyullei, 2025). In this Study same with systematic review by Yuniarsih that Leptospirosis cases mostly occur in people adults in the age group 20-50 years, male, and working as a farmer (Yuniasih et al., 2022).

An effective strategy for influencing behavioral change is the implementation of knowledge surveys, which are conducted to collect information and assess preventive efforts among at-risk populations. Arikunto categorizes levels of knowledge using a qualitative measurement scale into three groups: low (<56%), moderate (56%–75%), and high (>75%) (Abubakar, 2021). In this study, the majority of respondents demonstrated a moderate level of knowledge regarding leptospirosis. However, among individuals diagnosed with leptospirosis, most exhibited a low level of knowledge about the disease. This condition is consistent with the study by Ilma, et al., who reported that low community knowledge contributes to the high incidence of leptospirosis in endemic areas (ILMA et al., 2022). Similarly, (Rahim

et al., 2023), in a study of 184 municipal waste collectors found that 92,93% had low level of knowledge about cause, modes of transmission, symptomps and treatment of leptospirosis. Study in Surabaya also show from 70 people had 52,9% low level of knowledge about leptospirosis (Wulandari et al., 2024). These results align with the study of Firdaus which emphasized that community outreach andr education are crucial for improving knowledge about leptospirosis, particularly in coastal and flood-prone regions (Firdaus et al., 2025). Research conducted in Cilacap by the Center for Research and Development of Disease Vectors and Reservoirs also demonstrated that low levels of knowledge and poor community practices contribute to the increasing incidence of leptospirosis in endemic areas (Trapsilowati et al., 2021).

The low level of community knowledge is attributed to the lack of clear information regarding the causes, modes of transmission, and symptoms of leptospirosis. Therefore, health promotion and outreach activities conducted by healthcare workers must be intensified, particularly concerning communicable diseases such as leptospirosis. Examples include health promotion through community health volunteers during posyandu activities and the installation of easily visible posters in frequently visited public areas. Education through Community service also give significant change for example understanding of leptospirosis increased by 18% (Hidayati et al., 2025).

Beyond the aspect of knowledge, this study also found that the majority of respondents recognized the importance of timely access to healthcare services. This finding supports by Director of Prevention and Control of Vector-Borne and Zoonotic Diseases, Ministry of Health in Webinar of leptospirosis which emphasized that adequate healthcare access and improved environmental sanitation are key factors in reducing morbidity and mortality due to leptospirosis (WHO, 2020). Similarly, (Ginting & Indarjo, 2022) highlighted that community attitudes toward maintaining environmental hygiene and utilizing healthcare facilities play a crucial role in the prevention of leptospirosis.

Health Care Access

The majority of community members sought treatment from private medical practitioners or midwives located near their residences. In contrast, among individuals with leptospirosis, the initial action taken when experiencing illness was predominantly the purchase of medicine from local shops or pharmacies. This behavior was driven by the perception that recovery could be achieved more quickly through self-medication with medicine from local shops or pharmacies, thereby eliminating the perceived need to visit formal healthcare facilities. Additionally, the proximity of shops and pharmacies compared to healthcare facilities further influenced this preference. Same with study in Thailand show that 350 respondents aged 18–65 years from the fifth districts with the highest morbidity rate in 2010–2019 had moderate level of behaviour on buy a drug for treatment if they have a fever, muscle pain compared to go to primary health center.(Toemjai et al., 2022)

Family income is also considered a risk factor for the host, particularly within the socioeconomic dimension such as occupation. In this study, the majority of respondents reported a family income below the regional minimum wage (UMK) of Demak Regency, which amounts to Rp 2,680,421. Family income strongly influences respondents' decision-making regarding whether to seek medical care at healthcare facilities when ill. Field observations revealed that many respondents preferred to purchase medicine from local shops or pharmacies rather than visit healthcare facilities. This preference was based on the perception that buying medicine from shops or pharmacies is more economical, as it avoids additional expenses such as transportation costs to healthcare facilities.

One of the main challenges in leptospirosis control efforts in Indonesia is the delay in diagnosis, which largely results from patients seeking healthcare services too late (Kementerian Kesehatan, 2017). findings indicate that 54% of the community only visit healthcare facilities when symptoms have already appeared or when the illness has progressed to a severe stage. Specifically, among individuals with leptospirosis, 80% reported seeking healthcare services only after the onset of symptoms or in severe conditions. This delay contributes to the high case fatality rate (CFR) of leptospirosis in Bonang District, as late presentation to healthcare facilities also leads to delays in early clinical detection, resulting in patients being diagnosed at an advanced stage. In fact, leptospirosis treatment remains relatively

straightforward when patients are diagnosed at an early stage, as the disease is still responsive to antibiotic therapy available in primary healthcare centers (puskesmas) and hospitals.

According to the study conducted by Illahi (2015) on the relationship between healthcare access factors and preventive behaviors against leptospirosis, the reasons why community members did not seek treatment at healthcare facilities included difficulties in reaching primary health centers (12.5%) and dissatisfaction with the quality of healthcare services (10%) (Illahi & Fibriana, 2015). In this study, respondents' actions when ill (healthcare access) were distributed as follows: 40% sought treatment from midwives near their homes, 20% visited puskesmas, 31% purchased medicine from local shops or pharmacies, and 8% took no action. Among respondents diagnosed with leptospirosis, 67% preferred to purchase medicine from shops or pharmacies, and 14% did nothing, resulting in delayed visits to healthcare facilities until severe symptoms had already developed. Most respondents chose to consult midwives or private practitioners near their homes due to the perception that visiting puskesmas required long waiting times. Therefore, it is recommended that healthcare workers intensify community education regarding the risks of purchasing medicine from shops or pharmacies, as such medications may not correspond to doctors' prescriptions or disease symptoms. Furthermore, emphasis should be placed on the fact that services at puskesmas are of high quality, provided efficiently according to established procedures, and can be accessed free of charge through the national health insurance program (BPJS).

4. Conclusion

The majority of respondents demonstrated a moderate level of knowledge, whereas most individuals who had experienced leptospirosis possessed low knowledge about the disease. In general, respondents sought care from practicing doctors or midwives when experiencing mild symptoms. However, among leptospirosis patients, the majority initially purchased medicine from local shops or pharmacies and only visited health facilities once their condition had progressed to severe symptoms. Most respondents lived in close proximity to community health centers.

Based on these findings, several recommendations can be made: 1) Enhance community knowledge about leptospirosis, particularly regarding its causes, symptoms, and transmission routes, through health education supported by accessible media such as illustrated leaflets written in simple language. 2) Health workers and community health cadres should actively conduct outreach to emphasize the following: (a) Provide information on leptospirosis and other high-risk diseases. (b) Motivate communities to visit health facilities not only when ill but also for consultations to gain preventive health information. (c) Raise awareness about the dangers of purchasing medicine from shops or pharmacies without medical guidance, while stressing that services at community health centers are efficient, follow proper procedures, and can be accessed free of charge through the national health insurance (BPJS). (d) Inform local medicine sellers to encourage customers who feel unwell to seek care at health facilities rather than relying solely on self-medication. Interventions should prioritize low-literacy, high-risk households and strengthen the link between knowledge and timely health service access. Using simple, culturally appropriate educational media and involving local health cadres, pharmacies, and schools ensures that awareness translates into preventive behavior and early treatment-seeking.

This study is limited by its descriptive cross-sectional design, coverage of only one subdistrict, and reliance on questionnaire-based self-reports. While these findings provide valuable insights into knowledge and health service access in endemic hotspots, they cannot establish causal relationships or be generalized to all communities. Future research should employ analytical and longitudinal designs, expand geographic coverage, integrate qualitative methods, and link community data with clinical outcomes to strengthen evidence on how knowledge and health service access influence leptospirosis morbidity and mortality. The results in this study are representative of high-risk populations rather than the district as a whole, and we recommend that future studies include comparative samples from low-incidence villages to provide a more comprehensive district-wide perspective.

References

Abubakar, R. (2021). *Pengantar metodologi penelitian* (1st ed.). SUKA-Press UIN Sunan Kalijaga. https://digilib.uin-suka.ac.id/id/eprint/42716/1/PENGANTAR METODOLOGI PENELITIAN.pdf

Artus, A., Schafer, I. J., Cossaboom, C. M., Haberling, D. L., Galloway, R., Sutherland, G., Browne, A. S., Roth, J., France, V., Cranford, H. M., Kines, K. J., Pompey, J., Ellis, B. R., Walke, H., Ellis, E. M., Villarma, A., Carrillo, M., Delgado, D., Doyle, J., … Aponte, J. (2022). Seroprevalence, distribution, and risk factors for human leptospirosis in the United States Virgin Islands. *PLoS Neglected Tropical Diseases*, *16*(11), 1–21. https://doi.org/10.1371/journal.pntd.0010880

Badan Pusat Statistik Kab. Demak. (2022). *Profil Kesehatan Kabupaten Demak Tahun 2021*. BPS Statistik Kabupaten Demak. https://demakkab.bps.go.id/id/publication/2022/12/29/c614f97a0b774b4bc6c68390/profil-kesehatan-kabupaten-demak-2021-.html

Badan Pusat Statistik Kab. Demak. (2023). *Profil Kesehatan Kabupaten Demak Tahun 2022*. BPS Statistik Kabupaten Demak. https://demakkab.bps.go.id/id/publication/2024/09/27/583e87b95007d330db6b4b12/profil-kesehatan-kabupaten-demak-2023.html

Djafar, L., & Manyullei, S. (2025). Health Literacy Gaps in Leptospirosis Prevention: Evidence from an Analysis of Knowledge, Attitudes, Practices, and Perceptions in Limboto Lake, Gorontalo. *Journal of Cultural Analysis and Social Change*, *10*(2), 1188–1194. https://doi.org/10.64753/jcasc.v10i2.1750

Firdaus, A. K. B., Ashfa, S. M., Magviroh, S., Ismil, S., Suci, H., Indanah, & Hana, F. M. (2025). SOSIALISASI LEPTOSPIROSIS UNTUK MENINGKATKAN PENGETAHUAN MASYARAKAT TENTANG PENYAKIT LEPTOSPIROSIS. *Jurnal Abdimas Indonesia*, *7*(1), 74–79. https://ejr.umku.ac.id/index.php/JAI/article/viewFile/2714/1418

Ginting, G. K. R. B., & Indarjo, S. (2022). Lingkungan, PerilakuPersonal Hygiene, dan Pemakaian APDTerhadap Kejadian Leptospirosis. *Higeia Journal of Public Health Research and Development*, *6*(2), 236–250. https://journal.unnes.ac.id/sju/index.php/higeia/article/view/53916/21556

Hidayati, A. O., Zubad, M., Meilani, B. C., & Virgita, J. W. (2025). Edukasi Berbasis Masyarakat sebagai Upaya Pencegahan dan Penanganan Penyakit Leptospirosis. *APMa Jurnal Pengabdian Masyarakat*, *5*(1), 31–36. https://doi.org/10.47575/apma.v5i1.684

Illahi, A. N., & Fibriana, A. I. (2015). Faktor-faktor yang Berhubungan dengan Perilaku Pencegahan Penyakit Leptospirosis. *Unnes Journal of Public Health*, *3*(2), 126–135.

ILMA, K. ilma, Martini, M., & Mursid Raharjo, M. R. (2022). Spatial Analysis and Risk Factors of Leptospirosis in Indonesia. a Systematic Review. *Journal of Community Medicine and Public Health Research*, *3*(2), 129–139. https://doi.org/10.20473/jcmphr.v3i02.40660

Kementerian Kesehatan, D. J. P. P. D. P. L. (2017). *Petunjuk Teknis Pengendalian Leptospirosis (Revisi)*. https://www.slideshare.net/slideshow/bukupetunjukteknispengendalianleptospirosispdf/251887699

Rahim, F. F., Kader Maideen, S. F., Abdulrahman, S. A., & Rashid, A. (2023). Multinational municipal waste collectors and leptospirosis prevention: Assessment of knowledge, attitudes, practices and the associated factors. *Clinical Epidemiology and Global Health*, *20*(October 2022), 101235. https://doi.org/10.1016/j.cegh.2023.101235

Toemjai, T., Thongkrajai, P., & Nithikathkul, C. (2022). Factors affecting preventive behavior against leptospirosis among the population at risk in Si Sa Ket, Thailand. *One Health*, *14*(May), 100399. https://doi.org/10.1016/j.onehlt.2022.100399

Trapsilowati, W., Mulyono, A., Indriyani, S., Negari, K. S., Nugroho, A., Joharina, A. S., Pujiyanti, A., Ristiyanto, R., & Kinansi, R. R. (2021). Pengetahuan dan Perilaku Masyarakat, Serta Kondisi Lingkungan Pada Peningkatan Kasus Leptospirosis di Wilayah Puskesmas Kesugihan II, Kabupaten Cilacap, Jawa Tengah. *Buletin Penelitian Kesehatan*, *49*(1), 29–36. https://doi.org/10.22435/bpk.v49i1.4109

WHO. (2020). *Pencegahan dan pengendalian leptospirosis di Indonesia*. https://www.who.int/indonesia/id/news/detail/-leptospirosis-prevention-and-control-in-indonesia

Widodo, T. Y., & Edison, L. Z. F. (2025). Risk Factors and Prevention of Leptospirosis in Indonesia: A Review. *Journal of Health Science and Pharmacy*, *4*(1), 550–561. https://stikbar.org/ycabpublisher/index.php/jhsp/article/view/1233/505

Wulandari, M. S., Trisnawati, E. A., Husen, A., Taqiyah, H., & Hasina, S. N. (2024). RELATIONSHIP BETWEEN KNOWLEDGE AND COMMUNITY ATTITUDES IN PREVENTING LEPTOSPIROSIS. *Indonesian Journal of Global Health Research*, *6*(6), 3475–3482. https://doi.org/10.37287/ijghr.v2i4.250

Yuniasih, D., Ihsana, N., Shalsabila, D. A., & Sukirto, N. W. (2022). Systematic Review: Epidemiology of Leptospirosis in Indonesia. *Jurnal Kesehatan Masyarakat*, *10*(5), 544–549. https://ejournal3.undip.ac.id/index.php/jkm/article/view/34580