LEPTOSPIROSIS PREVENTION AND CONTROL WITH COMPREHENSIVE ON HEALTH APPROACH; Literature Review

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Abstract. Leptospirosis is an acute zoonotic disease caused by leptospira bacteria which can result in death. The cause of endemics in an area is influenced by behavioral, and environmental factors and sources of transmission. Environmental factors that influence rainfall, temperature, exposure to animals, and flooding. One Health is a collaborative effort from various sectors, especially the human, animal, and environmental health sectors, both at the local, national, and global levels in achieving optimal health. With the One Health approach, it is hoped that the prevention and control of emerging and re-emerging zoonotic diseases will be more effective and efficient. Objective: To identify the most appropriate One Health approach in preventing and controlling leptospirosis. Methods: The method used in this study was a literature search from 2 (two) electronic databases, namely Google Scholar and ScienceDirect. This study was based on a review of 221 clinical articles and research published between 2022 and 2023. Results: From the 221 articles used in this literature review, 6 showed that there was a significant correlation between the prevention and control of leptospirosis with the One Health model approach.Conclusion: The One Health approach model is one of the strategies to prevent and control leptospirosis through coordination.

Keywords: Prevention and Control of Leptospirosis, One Health Approach.

INTRODUCTION

Leptospirosis is an endemic disease in the world, several countries with tropical and subtropical climates are endemic areas of leptospirosis. Leptospirosis has a seasonal distribution and tends to increase with an increase in the intensity of rainfall or an increase in temperature and even this disease can occur throughout the year. The incidence tends to increase in developed countries with high-income residents, but leptospirosis also occurs in developing countries. (Costa et al., 2015).

Leptospirosis is an acute zoonotic disease caused by Leptospira bacteria with broaddisease aspects and can cause death. (Ministry of Health RI, 2017) Leptospirosis is a zoonosis that is suspected of being the most widespread in the world, known in several countries as "rat urine fever", the reason for the difficulty of clinical diagnosis and the high cost of diagnostic tools, many cases of leptospirosis go unreported. Leptospirosis is also known as “Weill's Disease”.(Cafasso, 2013) The problem of leptospirosis in each country is different, in Indonesia, it is influenced by socio-cultural, socio-economic factors, house density, work, behavior, and environmental factors (stagnant water and floods). The risk of leptospirosis transmissionis higher in rural areas because most of the people work as farmers or breeders.(Widiasihet al., 2021).

Leptospirosis in Indonesia is spread by bacteria in rats through urine into the environment. The type that causes the most severe and fatal disease is the Icterohemorrhagiae serotype. Types of Leptospira sp. can be found in domestic animals such as dogs, cows, pigs, and buffaloes and wild animals such as rats, ferrets, and squirrels. Humans can become infected due to contact with water or soil contaminated with urine or other bodily fluids of animals infected with Leptospira sp. and the bacteria enter through broken skin or mucous membranes. (Ashford et al., 2000)In Indonesia, several leptospirosis endemic areas pose a threat to the public health sector due to the presence of risk factors, namely the large population of rats (rodents) as a reservoir for leptospirosis, poor environmental sanitation and a large number of flooded areas, and until now leptospirosis continues to spread and cause death in humans. Research in Rio de Janeiro, Brazil that multivariate analysis of risk factors that influence the incidence of leptospirosis that occurs in urban areas with densely populated populations, flooded areas, poor waste management, reservoirs, and poor sanitation conditions.(Barcellos & Sabroza,2001).

Leptospirosis risk factors can be grouped into 3 main factors, namely: animal factors, environmental factors, and human factors.(Sakundarno et al., 2014) Infection in humans occurs because humans are directly exposed to infected animals, one of which is related to the type of work, namely

farmers, butchers, animal hunters, veterinarians, and rat exterminator workers. This type of profession has the potential to be contracted directly from the urine of infected animals. Exposure to leptospirosis indirectly through surface water, soil, and mud, which is the dominant cause of infection in humans. (Goaranth, 2016) Epidemiological risk factors include sanitation, housing, and rainfall (floods). Events related to levels of income, occupation, and travel, represent host-related epidemiological factors. Host susceptibility varies depending on age, genetic factors, skin integrity, and use of personal protective equipment/clothing, such as gloves and boots.(Supraptono et al., 2011) Silviana revealed that the variables that influence the occurrence of leptospirosis in the city of Semarang are environmental conditions, namely the rat population, wastewater disposal facilities, contact with rats, and the use of personalprotective equipment.(Silviana et al., 2016) In the highlands of Ponorogo Regency, EastJava, the factors that influence the incidence of leptospirosis are sociodemographic, behavioral, and environmental. (Notobroto et al., 2021).

The way humans and leptospires interact is related to the process of exposure and dose of the pathogen. Leptospirosis pathogens vary in causing a disease, also related to virulence, motility (the ability of the organism to move), and its ability to survive in the host and complement resistance. The type of reservoir host determines the type of pathogen present and its relationship to particular epidemiology(Haake & Levett, 2015).

Several areas in Indonesia are endemic areas for leptospirosis, but this disease has long been a health problem that has been neglected or neglected for a long time. *Neglected Disease*. Management of leptospirosis has not yet become a routine activity inseveral areas in Indonesia. In 2001, 139 human serum specimens were examined for leptospirosis and 18.7% were positive with the predominant serovar being serovar Batavia. According to WHO, Indonesia is one of the countries with high leptospirosis cases and is ranked third in the world for mortality. (WHO, 2020) Data for 2019 showed that there were 920 cases with a mortality rate of 122 cases due to the disease (CFR: 39.2per 100,000 population) spread across 9 provinces, namely Central Java 458 cases, Special Region of Yogyakarta 183 cases, East Java 147 cases, DKI Jakarta 37 cases, JavaWest 32 cases, Banten 52 cases, North Kalimantan 8 cases, South Sulawesi 1 case, and Maluku 2 cases. (Ministry of Health RI, 2020).

One Health is a collaborative effort from various sectors, especially the human, animal, and environmental health sectors, at the local, national, and global levels to achieve optimal health. The One Health and Eco Health approaches in dealing with the complexity of zoonoses show the result that a one-sectoral approach is not effective enough in solving zoonotic problems today. The method approach that has just begun tobe carried out by many countries and international institutions is through one health and eco-health. This approach involves cross-sectoral, multi-disciplines and considers environmental aspects. Through this approach, it is hoped that the prevention and controlof emerging and re-emerging zoonotic diseases will be more effective and efficient. (CDC, 2022).

Other sectors need their attention and cooperation in various efforts to control leptospirosis. The environmental sector, the agricultural sector, which so far have not been connected with leptospirosis control programs in the regions, and the health sector needto be involved in the biological management of disease vectors. Various sectors need to beintegrated with the control of rat or rodent pests which need to be prioritized. One Health approach is needed to connect related actors and sectors. Management and control of natural and social environmental risk factors are very important. The combined model based on an eco-social approach is an important tool for predicting the efficiency of leptospirosis control. (Djati et al., 2020)The purpose of this paper is to find out which One Health approach model is suitable or appropriate for preventing and controlling leptospirosis. After knowing the right model, the government sector, private sector or work partners, and the community are expected to cooperate intensively in prevention andtreatment to minimize cases and deaths from leptospirosis.

METHODS

This study uses a type of literature review method. The method begins with conducting a scientific literature search on the database using the keywords prevention and control of leptospirosis, the One Health approach. After that, an abstract review was carried out on each selected article. After reviewing the researcher will summarize the contents of the article, analyze the summary results and report the results of the article review in written form. The literature search was carried out using the Google Scholar and ScienceDirect platforms. The inclusion criteria in this study were in the form of freefull text, published in English, published in 2022 - 2023, and have an ISSN. As for the exclusion criteria, namely

not having full text, paid articles, literature review articles, duplication, and not relevant to keywords

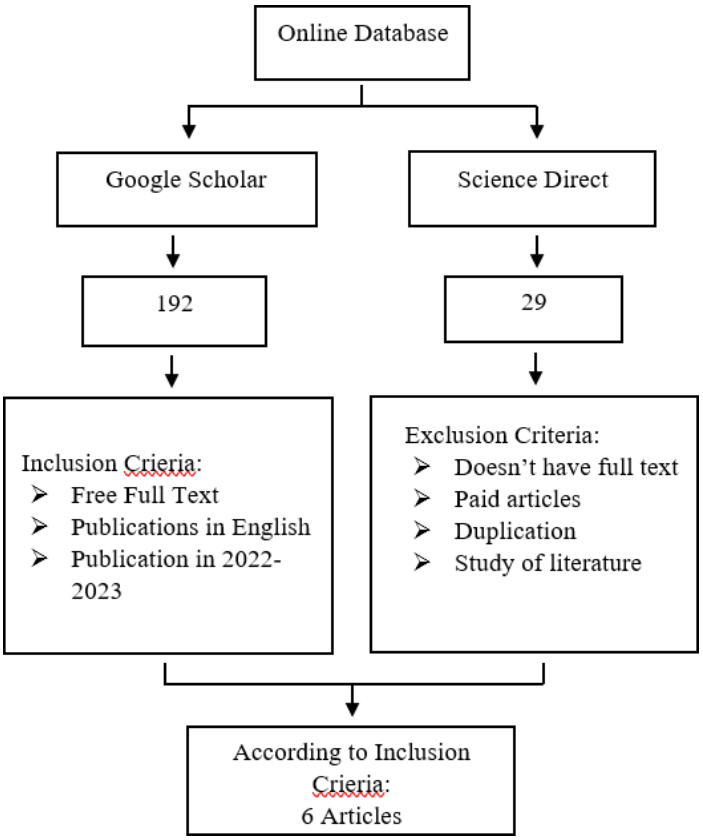

Figure 1. Literature Review Method

RESULTS AND DISCUSSION

After screening data from 2 databases, a total of 6 literature that met the inclusion criteria were obtained and then reviewed by the researcher. The results of the review aresummarized in written form for further discussion which can be seen in Table 1.

Table 1. Research Characteristics

No	Author, Year	Research Title	Location
1	Hong Tham Pham, Minh-Hoang Tran. 2022	One Health: An Effective and Ethical Approach to Leptospirosis Control in Australia	Australia
2	Jairo Enrique Palomares Velosa, Sebastián Riaño Sánchez, Anamaría Martínez Marín, Natalia Margarita Cediel Becerra. 2022	Prevention of exposure to zoonoses in rural Latin America:Social-ecological factors in a diverse regional context.	Latin America
3	Ndungu S. Nyokabi, Henrietta Moore, Stefan Berg, Johanna Lindahl, Lisette Phelan, Gizachew Gimechu Worku, Adane Mihret, James LN Wood. 2023	Implementing a one-health approach to strengthen the management of zoonoses in Ethiopia.	Ethiopia
4	Willis Gwenzi, Emilia C. Skirmunt, Tendai Musvuugwa, Charles Teta, Dariusz Halabowski, Piotr Rzymski. 2022	Grappling with (re)-emerging infectious zoonoses: Risk assessment, mitigation framework, and future directions.	Zimbabwe

5	Mahendra Pal, Mati Roba Bulcha, Wakuma Mitiku Bune. 2022	Leptospirosis and One Health Perspective	India
6	Patricia Hernández-Rodríguez, Brayam Trujillo-Rojas. 2022	One Health: A Comprehensive Approach to improve prevention and control strategies in Leptospirosis	Columbia

Table 1 shows 6 studies in 6 countries regarding the control of zoonoses (leptospirosis)using the One Health approach.

Table 2. Review of Articles Related to Research Results

No	Research Title	Research result
1	One Health: An Effective and Ethical Approach to Leptospirosis Control in Australia. (Pham & Tran, 2022)	Determining priorities and allocating resources requires comprehensive consideration, including consideration of ethical principles, effectiveness, socioeconomic status, etc. The multisectoral approach that One Health recommends is very useful and necessary for controlling leptospirosis. The adequacy of OneHealth is reflected in the context of economic, social, and political factors. One Health is very effective and ethical in the process of diagnosing, preventing, and controlling leptospirosis. Applying these two aspects can form a picture that the role of the One Health approach in controlling leptospirosis and other infectious diseases is very effective and ethical.
2	Prevention of exposure to zoonoses in rural Latin America: Social-ecological factors in a diverse regional context.(Palomares Velosaet al., 2022)	The Eco-Health / One Health (OH) perspective proves that there is an interrelated relationship between human, animal, and ecosystem health. OH has an important effect on the social, political, economic, and health subsystems so that it can make the cost of handling zoonoses more controllable. In addition, prevention programs must involve multi-sectors on health issues, to reduce knowledge gaps and priorities between actors in social ecosystems.
3	Implementing One Health (OH)approach to strengthen the management of zoonoses in Ethiopia.(Nyokabi et al., 2023)	There are gaps in OH implementation on the interaction between human, and animal health, and environmental health in Ethiopia. Community involvement is needed to ensure the successful implementation of OH by getting support and participation from stakeholders in the health sector. It needs financial support from all government-owned health institutions to achieve good results even with limited resources. OH is implementable and can be used as a model to enhance OH cooperation across Ethiopia.

4	Grappling with (re)-emerging infectious zoonoses: Risk assessment, mitigation framework, and future directions.(Gwenzi et al.,2022)	Low-income countries are potential hotspots for future global outbreaks of zoonotic infections due to close human-wildlife interactions, driven by changes in land use, increased human populations, and increased demand for food. Diseases originating from zoonoses arise due to several risk factors, namely close and significant human-wildlife interactions; poor governance and regulatory systems that encourage corruption, poaching, and illicit trade in wildlife and wildlife products; lack of oversight of systems for zoonoses; lack of public and stakeholder awareness. The need for further research on the assessment and mitigation of zoonoses in low-income countries, the international research communityand funders must work together and prioritize research on zoonoses. Bearing in mind that outbreaks of zoonotic infectious diseases are increasingly increasing the risk to human health because global diseases do not know the boundaries of countries and continents.
5	Leptospirosis and One Health Perspective. (Pal et al., 2021)	Breakthrough strategies in the host-pathogen relationship and their ecosystem can provide effective control of zoonoses including leptospirosis. There is a need for a global strategy to expand interdisciplinarily partnerships and coordination across all health, animal, and environmental sectors.
6	One Health: A Comprehensive Approach to improve prevention andcontrol strategies in Leptospirosis.(Hernández-Rodríguez & Trujillo-Rojas, 2022)	One Health reflects the need for management that is inseparable from regulations dealing with human, animal, and environmental health. This structure directs us to tend to use a holistic approach, looking for new organizational forms, and new strategies to study, control and control leptospirosis which is the responsibility of various sectors and disciplines. Comprehensive management of leptospirosis implies a higher level of understanding of the biological, socioeconomic, and cultural agentsand risk factors in the area. From a practical perspective, it is necessary to promote collaborative work initiatives as well as the need for "One Health" collaboration to deal with zoonoses which are a public health problem.

Table 2. Describes the research results of each article that has been reviewed. Most of the articles reviewed stated that the One Health approach proved a significant relationship between human, animal, and environmental health which affects the social, political, economic, and health subsystems. Even the research conducted by Erkyihun, theOne Health approach in controlling leptospirosis and other infectious diseases is very effective and ethical.(Erkyihun et al., 2022) According to Nyokabi, it is necessary to involve the community to ensure the successful implementation of OH, the need for support and participation from stakeholders in the health sector, and the need for financialsupport from all government-owned health institutions to achieve good results.(Nyokabi et al., 2023) One health is a breakthrough strategy in the relationship between the host-pathogen and its ecosystem so that it can provide effective control of zoonoses, including leptospirosis. There is a need for a global strategy to expand interdisciplinary partnerships and coordination across all health, animal, and environmental sectors. (Pal etal., 2021) In general, based on this literature review study, it can be stated that there are 6(six) factors related to or influencing the control of leptospirosis with the One Health approach, namely community participation, the role of fields dealing with human health, animal health, the environment, financial support or funding and regulations from the local government which will then be explained in the discussion.

Leptospirosis is also known as flood fever or flood fever because this disease appears as a result of flooding.(Yupiana et al., 2010) Leptospirosis can be transmitted directly between humans (host) with

infected animal urine or tissue and indirectly due tocontact between humans and water, contact with soil or plants contaminated with urine from infected animals *leptospira*. It can also be transmitted through contact with the skin,especially if there is a wound or mucous membrane contact with water, wet soil, or plants,especially sugar cane contaminated with infected animal urine, swimming in an open pool, injuries that occur due to work accidents; direct contact with infected animal urine or body tissue; sometimes through food contaminated with urine from infected rats. (James Chin, MD, 2000). While many definitions of One Health are used, the common understanding is cross-sectoral collaboration giving rise to an approach to design and implement programs, policies, legislation, and research that engages multiple sectors to communicateand work together to achieve better public health outcomes. Areas of work with a highlyrelevant one-health approach include food safety, control of zoonoses (diseases that can be spread between animals and humans, such as the flu, rabies, and Rift Valley Fever), and fighting antibiotic resistance (when bacteria change after exposure to antibiotics and become more difficult to treat). (WHO, 2020)By engaging experts in human health, animal health, environmental health, multi-disciplinary, and other related sectors, the One Health approach can control public health threats and study the spread of disease amongpeople, animals, plants, and the environment. (CDC, 2022).

One Health is a strategy to strengthen cross-sectoral roles for environmental interventions in leptospirosis early warning systems by implementing agreed strategies for the prevention and control of zoonotic diseases and New Infectious Diseases (PIB) that are cross-sectoral. Meanwhile, according to the American Veterinary Medical Association, One Health is an integrative effort from various disciplines working at the local, national, and global levels to achieve optimal health for humans, animals, and the environment. (King, 2008)A One Health approach strategy in developing a communication strategy is needed at every level of government as part of strengthening government capacity in preventing and controlling the disease. Hernandez found that One Health needs management that is inseparable from regulations dealing with human health, animal health, and the environment. This structure leads to tend to use a holistic approach, looking for new organizational forms, and new strategies for learning in controlling leptospirosis which is the responsibility of various sectors and disciplines. Comprehensive management of leptospirosis implies a higher level of understanding of the biological, socioeconomic, and cultural agents and risk factors in the area and from a practical perspective is necessary to promote collaborative working initiatives; (Hernández-Rodríguez & Trujillo-Rojas, 2022).

In his article, Orlando et al stated that human health, animal health, plants,ecosystem health, and biodiversity must all be handled together, in terms of global-scale health protection and a cross-sectoral perspective. An integrated approach to reducing thenegative impact of leptospirosis, based not only on One Health values but also oneconomic facts, principles of social justice, and global access to health services that aregood for people, animals, and the environment. The "One Health" approach is a global policy that emphasizes the need for a comprehensive understanding and a transdisciplinary approach to addressing human, animal, and habitat health that integrates multi-sectoral knowledge. Biological and ecological factors of Leptospira, their hosts, andvectors, play a role in the emergence and re-emergence of diseases.(Orlando et al., 2020) Article by Robert et al, with community participation and collaborative strategies, the implementation of interventions in disease control must be implemented by various sectors and stakeholders to be able to prevent and control leptospirosis effectively. (Roberts, 2019).

CONCLUSION

Based on research from several journals in this literature review, it can be concluded that the One Health approach is one of the strategies for preventing and controlling leptospirosis through intensive and comprehensive coordination, communication, cooperation, and collaboration across sectors, partners namely human health, animal health, and environmental health. Further research is needed on zoonoses to detect and strategies for prevention and control, especially leptospirosis

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