



Unraveling the leptospirosis epidemic: tales from the Philippine outbreak – a short communication

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Abstract

Leptospirosis, also known as Weil's disease, is an emerging zoonotic infection that occurs worldwide but is particularly common in the tropics. There has been an increasing trend of leptospirosis in the Philippines since the outbreak occurred in 2020. The number of reported cases was 182 in 2020, 1661 in 2021, and 2794 in 2022. This present article aimed to access previously published studies on the prevalence, implications, and efforts to combat leptospirosis worldwide, with a particular focus on the Philippines from 2001 to 2023. In writing this article, we conducted a thorough search of databases such as PubMed, Researchgate, Web of Science, Scopus, and Google Scholar within 20 years. This present article found that more than 810 cases were reported from 1 January to 4 March 2023. The Cagayan Valley Region has 103 cases, the Zamboanga Peninsula has 77 cases, and the Western Visayas Region has 176 cases, making them the worst-hit areas. The increase in leptospirosis cases in the Philippines is primarily attributed to several factors. Firstly, the country is prone to natural disasters such as typhoons, floods, and landslides, which increase the risk of water sources and the environment being contaminated with *Leptospira* bacteria. To address the menace of leptospirosis in the Philippines, we urge the Philippine government to focus on improving healthcare infrastructure, providing swift, reliable, and effective treatments, implementing safety regulations, supplying personal protective equipment to medical authorities, and taking strict actions to improve water sanitation.

Keywords: hemorrhage, leptospirosis, meningitis, outbreaks

Introduction

Leptospirosis, also called Weil's disease, is an emerging zoonotic infection that occurs worldwide but is significantly more common in the tropics^[1]. The spirochete responsible for this disease is *Leptospira* spp, which is the primary cause of leptospirosis. The main hosts of bacteria are rodents, while household pets and livestock can also serve as incidental hosts^[2]. Humans become infected through direct contact with diseased animals' urine or indirect contact with contaminated soil and water, where *Leptospira* spp. is present. Leptospirosis is caused by bacteria that can survive for long periods^[3]. Additionally, these bacteria can

enter the body through breaks in the skin, wounds, or membranes in the mouth, eyes, and nose^[4]. Symptoms of leptospirosis in humans can vary from being asymptomatic to being extremely severe or life-threatening^[5]. These symptoms can range from a mild flu-like illness to more serious complications such as jaundice, meningitis, hemorrhage, and renal damage. However, the disease is often misdiagnosed as other febrile infections like scrub typhus, dengue, and chikungunya. Therefore, the actual prevalence of leptospirosis remains unknown^[6].

The occurrence and spread of leptospirosis have been altered due to changes in animal husbandry, human behavior, and climate^[7]. Various environmental contexts and risk exposures have been linked to reports of leptospirosis. Leptospirosis is prevalent in the Philippines due to its location in the tropics along the typhoon belt. Outbreaks typically occur after floods or heavy rainfall in flood-prone places like Metro Manila^[8]. Therefore, leptospirosis epidemics in urban areas have been linked to the growth of slum areas, inadequate waste management, heavy rainfall, and flooding. These factors create ecological conditions that facilitate the spread of rat-borne diseases. In rural areas, leptospirosis is described as an occupational illness among agricultural and animal workers in rural settings^[9].

Studies have revealed that the Philippines experiences an average of 680 cases and 40 leptospirosis-related deaths annually^[10]. However, there has been an increasing trend since the outbreak occurred in 2020. In 2020, there were 182 reported cases, followed by 1661 cases in 2021, and 2794 cases in 2022^[11]. Recently, we have found that more than 810 cases were reported from 1 January to 4 March 2023. The Cagayan Valley Region has 103 cases, the Zamboanga Peninsula has 77 cases, and the Western Visayas Region has 176 cases. These are the worst-hit areas^[12].

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Due to the recent discovery of leptospirosis in the Philippines, we consider this to be a significant public health concern, both in the Philippines and globally. The increasing incidence rate and significant health and economic impacts make it crucial to identify gaps in recent cases of leptospirosis and suggest public health measures and recommendations to the government of the Philippines. Also, only a limited number of studies have been done so far to find a long-lasting solution to the epidemics of leptospirosis in the Philippines. This present article therefore aims to unravel the leptospirosis epidemic in the Philippines and efforts to mitigate the disease in the Philippines.

Epidemiology of leptospirosis in the Philippines

Leptospirosis is a common infection that can occur worldwide and is often linked to specific seasons, such as increased rainfall or hot weather. However, it can occur at any time of the year. Outbreaks of leptospirosis could be caused by various factors, including changes in human behavior, contamination of the water supply by sewage or animal waste, changes in animal population density, or natural disasters such as cyclones and floods^[12].

A literature review by Boey *et al.*^[13] studied the global prevalence of *Leptospira* exposure and infection in rats. The articles reported pertinent information from a total of 62 geographic locations. The study findings suggest that India, Malaysia, Brazil, Thailand, and France are the top five nations among those reported. The prevalence of *Leptospira* in rats varied greatly. For instance, two studies in Australia found a very low prevalence of 1.7 and 2.9%, while studies in Ecuador and China found a prevalence of 3.0%. The prevalence of the disease in rats was zero in some studies, including those conducted in Thailand, Madagascar, Tanzania, and the Faroe Islands. However, in some countries, such as Brazil, Mexico, Egypt, Reunion, and the Philippines, other studies have found a prevalence of over 70%. The prevalence rates reported from the same nation also showed significant variations. For instance, studies in Hawaii reported prevalence rates of 16, 24, 4, 30, and 53.3%. For example, studies from Trinidad have reported a prevalence of 16.5, 17.4, and 20.5%. However, there were other instances in which independent studies from the same geographic area reported a similar prevalence rate. One of the articles related to Malaysia reported a prevalence of 3.1%, while the other reported a prevalence ranging from 8 to 18%^[13]. The results of papers that conducted research on residents of Katavi between 2012 and 2014 showed that out of 1546 tested samples between 1997 and 2019, 209 tested positive for antibodies against *Leptospira* serogroups. The prevalence of anti-*Leptospira* antibodies ranged from 0.3 to 29.9% depending on the study area, study design, and interpretation of the results^[14].

A multilocation study should be conducted worldwide to investigate the impact of environmental factors, human factors, and leptospiral virulence factors on the clinical symptoms and outcomes of leptospirosis. Workplace hazards, such as animal contact, handling of animal waste, and the use of animal products, are significant risk factors^[14]. Several axes can be used to construct disease prevention procedures. These include infectious source control, transmission interruption, human immunization, animal immunization, and environmental decontamination. To reduce the risk of infection, it is important to avoid contact with animal urine, infected animals, or an infected environment^[12].

Public health implications of leptospirosis in the Philippines

According to the WHO, leptospirosis is estimated to cause more than one million severe cases and 58 900 deaths globally each year, with the majority of cases occurring in developing countries^[6]. The Philippine news agency reported that between 1 January and 18 March, there were 1015 leptospirosis cases reported nationwide, which is an increase of 188% compared to the 353 instances during the same period in 2022^[15]. The increase in leptospirosis cases in the Philippines is primarily attributed to several factors. Firstly, the country is prone to natural disasters, such as typhoons, floods, and landslides. These disasters increase the risk of water sources and the environment becoming contaminated with *Leptospira* bacteria. Secondly, poor sanitation and hygiene practices, especially in urban areas, contribute to the spread of the disease^[16]. Additionally, there is a lack of awareness and understanding about leptospirosis among the general population, health workers, and policymakers, which hampers effective prevention and control efforts. The implications of the rising cases of leptospirosis in the Philippines are multifaceted. Firstly, it poses a significant public health threat, particularly to vulnerable populations such as farmers, fisherfolk, and slum dwellers. Leptospirosis can cause severe and sometimes fatal complications, such as liver and kidney failure, meningitis, and respiratory distress syndrome (Table 1).

The disease also has economic consequences, as it can lead to a loss of productivity and income, especially in rural areas where agriculture is the main livelihood^[17]. Additionally, the increase in leptospirosis cases in the Philippines has broader implications for the international community, particularly in the context of global health security. The Philippines is a major hub for international trade and travel, which increases the risk of the disease spreading beyond its borders. Moreover, the country is a hotspot for emerging infectious diseases, such as dengue, Zika, and COVID-19. This further highlights the need for strengthening health systems and preparedness for future outbreaks^[18]. To address the rising cases of leptospirosis in the Philippines, a comprehensive and multisectoral approach is needed, involving the government, civil society, and international partners. This approach should focus on improving sanitation and hygiene practices, strengthening surveillance and laboratory capacity, enhancing public awareness and education, and providing access to affordable and quality healthcare services, particularly in rural areas^[19]. Additionally, there is a need for research and innovation to develop effective vaccines, diagnostic tools, and treatment options for leptospirosis. It is essential to prioritize and invest in preventive and control measures to address this re-emerging infectious disease and prevent its spread beyond the borders of the country^[19].

Table 1
Outbreak of leptospirosis in the Philippines according to regions

Year	Region	Cases	Death	CFR%	Reference
2009	Metro Manila	2299	178	8	[27]
2011	Northern Mindanao	1124	101	9	[28]
2013	Calabarzon	1024	62	6	[29]
2015	Western Visayas	902	55	6	[30]
2023	Nationwide	807	52	6	[31]

The impact of the current alarming outbreak on public health and the current challenges

During the current outbreak of leptospirosis in the Philippines, the number of cases has significantly increased, leading to increased hospitalizations and potentially higher mortality rates^[20]. It has had an abysmal impact on vulnerable populations, especially those residing in poverty or areas with inadequate sanitation and infrastructure. This has increased the risk of infection and complications in that population. The outbreak has increased the demands of medical facilities, leading to additional strain on the healthcare system while managing the increased patient load^[13]. Limited diagnostic capabilities, such as laboratory tests or specialized equipment necessary for confirming leptospirosis cases, have further aggravated the challenges. Additionally, access to healthcare services is limited in remote or disadvantaged areas. This can limit prompt medical intervention for suspected or confirmed cases of leptospirosis. Transportation hindrances and poor healthcare infrastructure further contribute to the challenges of providing comprehensive care to affected individuals. Insufficient resources, such as surveillance systems and funds for health systems, are hampering the effective monitoring and control of leptospirosis outbreaks in some areas of the Philippines^[11]. It is becoming challenging to raise awareness regarding public education campaigns and provide protective equipment in densely populated or remote areas^[19]. The leptospirosis outbreak has had a significant impact on the national economy and has had dreadful consequences. The increased burden on healthcare systems and the loss of productivity due to illness or death have impacted the affected communities and the overall economy. Also, outbreaks have discouraged tourism and investment in the affected region^[14].

There is a need for global health attention to combat leptospirosis in the Philippines.

As more is learned about the disease and new obstacles are discovered, the policies of the Global Leptospirosis Environmental Action Network (GLEAN) have been developing steadily since the initiative's conception. When the GLEAN initiative was first launched, priority was given to human outbreaks. However, it has become clear that the level of disease endemicity, as well as animal infections and the circulating serovars, plays a very important role in the explosiveness of human outbreaks. By focusing only on human outbreaks, a significant portion of the disease burden and underlying issues are being ignored^[21].

Regional and temporal variations in these elements necessitate ongoing global surveillance efforts. Recently, there has been global progress in leptospirosis, which requires increased international attention to its significance in clinical and public health^[22]. Building global cooperative efforts should focus on organizations like the International Leptospirosis Society^[23].

To address significant global issues, it is important to seek sustained support from organizations such as the WHO, the Food and Agricultural Organization (FAO), the Pan American Health Organization, the US National Institutes of Health, and the European Union (EU). These organizations can help address central problems of international importance. Some of the major issues that need attention include: the establishment of regional and national networks of leptospirosis diagnostic laboratories with appropriate quality assurance controls, the development of an international registry of cases with an estimated incidence and

prevalence, to provide policy guidance to public health authorities, Qualified laboratories can access central repositories of leptospiral strains, hybridomas, reference polyclonal antisera, and monoclonal antibodies at a low cost, creating a global, multicentre, prospective cohort study to examine how environmental factors, human factors, and leptospiral virulence factors influence the clinical symptoms and clinical outcome of leptospirosis, and creating a specimen bank from well-characterized leptospirosis patients, environmental sources, and zoonotic sources would entail collecting leptospiral isolates, clinical blood, and urine samples for molecular identification of *Leptospira* and testing new diagnostic procedures, patient DNA samples for identifying genetic relationships between various leptospirosis infection outcomes, environmental water samples from endemic and epidemic regions.

Recommendations

The first and most crucial step in addressing leptospirosis in the Philippines is prevention^[24], of which should be achieved through proper water sanitation, immunization of livestock, strict control of the rodent population, personal hygiene, effective water purification, and wearing protective clothing^[24]. It is crucial for the government of the Philippines, through its Ministry of Health, to advocate for mass education and provide a traveler's guide about prophylactic medicines like doxycycline (an antimicrobial agent). When going outside in the Philippines, we recommend that the Philippines should wear special clothing that covers the entire body and protects any exposed skin. The Philippines should report any illnesses related to fever, whether suspected or confirmed, to the health authorities in the country as soon as possible. By doing so, medical professionals can provide early treatment and identify the source of the disease in its initial stages. We suggest that a close relative or carer take on this responsibility to ensure prompt attention to the illness^[24].

Similarly, we urge the Philippines government to provide more rapid diagnostic testing facilities in all healthcare settings across all states in the Philippines especially those in the remote areas, as prompt diagnosis is necessary for such a deadly zoonotic disease. We urge the people in the Philippines who are involved in farming and livestock activities to use protective eyewear, rubber boots, and gloves because they are at a higher risk of being infected with *L. interrogans*^[25]. According to the Centres for Disease Control and Prevention (CDC), the government of the Philippines needs to take early and effective steps to minimize the spread of the disease by implementing guidelines released by the WHO^[26].

Given the current challenges faced by the country, public service awareness campaigns are essential. The campaigns can be conducted through various channels, such as television and social media platforms like Facebook, Twitter, Instagram, etc. Public figures and philanthropists in the Philippines should also help by promoting campaigns against leptospirosis in the country. The health authorities in the Philippines should encourage the population of the Philippines to follow the preventive measures recommended by the WHO^[26]. Additionally, we recommend full community participation in the spirit of self-reliance in the fight against leptospirosis in the Philippines. Integrated collaboration should be ensured between all relevant departments of the country^[24]. Lastly, the government of the Philippines should work on improving healthcare infrastructure, providing swift, reliable, and effective treatments, imposing safety regulations,

providing personal protective equipment to medical authorities, and taking strict actions to improve water sanitation. If all these recommendations are implemented, we believe that the incidence of leptospirosis in the Philippines would decrease significantly, potentially leading to its complete eradication.

Conclusion

This short communication emphasizes the importance of ongoing investigation, monitoring, and readiness to address the leptospirosis pandemic in the Philippines. Climate change and socio-economic variables are predicted to have an impact on the dynamics of it. To mitigate the effects of this neglected tropical disease and protect public health, it is crucial to have cooperative efforts between health authorities, researchers, and communities in the Philippines towards the fight against leptospirosis and other zoonotic diseases in the country.

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