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Review Article

# Leptospirosis: A Neglected Zoonosis of Public Health Concern

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## Abstract

Leptospirosis is an important emerging and re-emerging zoonotic disease that is spread worldwide by pathogenic species of the bacterium genus *Leptospira*. The disease is commonly reported especially in tropical and subtropical areas. Leptospirosis is a neglected tropical zoonotic disease that is rapidly becoming a major public health issue around the world. Leptospirosis has emerged as a prominent cause of acute febrile disease in many developing nations due to neglect, rapid, unplanned urbanization, and poor sanitation. Although it has been stated that leptospirosis is the most frequent zoonotic illness, it is thought to be underreported due to the non-specificity of clinical symptoms and the lack of laboratory confirmation in endemic areas. A wide range of clinical manifestations, ranging from asymptomatic infection to fulminant, deadly disease, is characteristic of the disease. Laboratory help is needed to confirm an unequivocal diagnosis of leptospirosis. Antibacterial antibiotics are used to treat the acute illness in the patient. This mini review includes all current information on leptospirosis, including its etiology, transmission, clinical symptoms, diagnosis, treatment, and preventative measures.

**Keywords**: Leptospirosis; Neglected Zoonosis; Public Health; Reservoir; Worldwide

## Introduction

Leptospirosis is a bacterial zoonosis as it is transmitted from animals to humans; and is caused by spirochetes of the genus *Leptospira* that is found all over the world. The Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) have classed it as an emerging or re-emerging infectious disease [1]. The pathogenic and saprophytic leptospiral strains were identified as 30 serotypes and more than 350 serovars [2].

Leptospirosis is a disease that affects the wild and domestic animals, as well as the human populations, all over the world. Farmers, fishermen, veterinarians, and those who work in sewers and slaughterhouses are frequently affected with *Leptospira* infection [3.4]. Because the disease is an animal health problem and a source of economic loss in the same disadvantaged circumstances, leptospirosis lends itself to One Health interventions [5,6].

Humans, dogs, horses, pigs, and other domestic animals are all susceptible to pathogenic *Leptospira* species, and they may share living areas. The identification of factors influencing leptospiral dynamics in host populations, such as environmental transmission factors, may aid in the development of intervention, control, and prevention strategies for the urban human leptospirosis and its public health implications [7]. Because resource-poor developing nations of the world are unable to provide the basic medical treatments to agricultural farmers and urban slum dwellers, the

World Health Organization (WHO) considers leptospirosis to be a neglected zoonotic disease [1].

Leptospirosis is endemic mainly in countries with humid tropical or subtropical climate. Though the disease is known to be prevalent in tropical regions, now, leptospirosis is also seen in the temperate regions due to various factors like climate change and human migration/habitation with unplanned or poor sanitation, waste disposal, and management [5]. The present communication is an attempt to delineate the public health importance of leptospirosis, which is considered as a neglected zoonosis.

## Etiology

Etiology of leptosprosis disease was proven in Japan and Germany on multiple occasions in 1915 [8]. Leptosprosisis caused by pathogenic species of the bacteria genus *Leptospira*, which has over 250 well-known serovars that are easily grouped into serogroups based on antigenic similarities.

The domestic and wild animals may act as reservoirs for spirochaetes by establishing symptomless proximal nephritic tubules and shedding the organism in their urine, resulting in ongoing environmental contamination [9]. The species of *Leptospira* and some pathogenic serovars are summarized in table 1.

| Species | Selected Pathogenic Serovars |
|---|---|
| *L. interrogans* | Icterohaemorrhagiae, Copenhageni, Canicola, Pomona, Autumnalis, Lai, Pyogenes, Australis, Bratislava. |
| *L. noguchii* | Pnama, Pomona |
| *L. borgpetersenii* | Ballum, Hardjo, Javanica |
| *L. santarosi* | Batavaie |
| *L. kirscneri* | Bim, Bulgarica, Grippotyphosa, Cynopteri |
| *L. weilii* | Celledoni, Sarmin |
| *L. alenxanderi* | Manhao |
| *L. genomespecies* | Sichuan |
| *L. fainei* | Hurtsbridge |
| *L. meyeri* | Sofia |
| *L. inadai* | Indeterminate |

**Table 1:** Species of *Leptospira* and some pathogenic serovars.

Source: [10].

## Transmission

Through asymptomatic colonization of the proximal renal tubules, domestic and wild animals can serve as reservoirs of pathogenic *Leptospira*, shedding the organism in the urine and contaminating the environment [3,11]. The infection is contracted after coming into direct contact with the urine of infected animals or coming into contact with the environment or water polluted with the urine of infected animals [9]. Humans are accidental hosts who become infected after coming into touch with carrier animals' body fluids or polluted water and soil [12].

In some areas, animals serve as reservoirs for distinct *Leptospira* serovars. Transmission of infection from the animal reservoir occurs through direct or indirect contact. The contaminated urine, vaginal or placental fluids, skin wounds, or ingestion of contaminated tissues are all examples of direct contact [3,13]. Indirect contact occurs when an animal comes into contact with polluted water, objects, or other materials in its surroundings [3,11]. Animals that have been infected might serve as *Leptospira* reservoirs for a long time. Further, the animals have the ability to infect other animals as well as humans [14].

## Clinical spectrum

The clinical signs range from mild illness to severe disease with a significant fatality rate. Leptospirosis in humans produces severe multi-organ dysfunction, which can lead to multi-organ failure and death [15]. Leptospirosis is a febrile infectious disease with a high mortality rate. The infection in people can range in intensity from clinically undetectable to life-threatening. The affected person can show a variety of clinical symptoms such as high fever, headache, reduced appetite, nausea, vomition, abdominal pain, conjunctivitis, hepatitis, anemia, jaundice, nephritis, albuminurea, bronchitis, pneumonia and meningitis [3,11]. Eight *Leptospira* serovars are clinically and epizootiologically/epidemiologically important in dogs, cats, and humans [14].

## Epidemiology

Due to the influence of globalization and climate change, leptospirosis has recently become a global public health threat. The prevalence is substantially higher in warm climate countries than in temperate regions, owing to the ability of leptospires to survive longer in the warm, and humid environments. Epidemics are now known to be caused by natural disasters and extreme weather

occurrences [5]. Leptospirosis is a severe hazard to global public health, with an estimated 1.03 million cases and 58,900 fatalities each year [16].

Adequate surveillance and diagnosis can provide a good understanding of leptospirosis epidemiology (e.g., the reservoir animals involved, the circulating *Leptospira* strains, seasonal and geographical trends, and specific people at risk) [17].

In temperate countries, where temperature is a limiting factor in the survival of *Leptospira*, the disease is most prevalent in the summer or fall, and in warm-climate regions, during rainy seasons [8].

Leptospirosis is expected to affect around 1.03 million people worldwide each year, with a death rate of 5.7 percent [12]. In underdeveloped nations like India, Thailand, and Fiji where endemic transmission and outbreaks of this spirochetal disease produce substantial mortality and morbidity, leptospirosis is a serious public health issue. If severe leptospirosis is not treated, the mortality rate might reach 40%; hence, an early diagnosis is critical for effective antibiotic therapy [8]. Overall, the global mortality rate is believed to be around 10%, with underdeveloped countries experiencing fatality rates as high as 25% [18].

## Diagnosis

Due to non-specific clinical manifestation of leptospirosis, the laboratory help is imperative to establish correct diagnosis of disease. Dark field microscopy is used to detect the organism in the freshly voided urine [19]. The isolation of the pathogen from the clinical specimens on various laboratory media such as Staurt's medium, Korthops's medium and EMJH (Ellinghausen–McCullough–Johnson–Harris) medium can be attempted specimens on various laboratory media such as Staurt's medium, Korthops's medium and EMJH medium [19]. However, the gold standard for leptospirosis diagnosis is the microscopic agglutination test (MAT), which evaluates agglutinating antibodies in sera for distinct serovars of *Leptospira* species. The enzyme-linked immunosorbent assay (ELISA) has been widely used to detect immunoglobulin M (IgM) antibodies and is more sensitive than MAT. Several commercially accessible fast antibody detection technologies that identify genus-specific antibodies either IgM or both IgG and IgM are now available. The reported sensitivities of these assays have ranged from 87 to 100% [8].

Polymerase chain reaction can be used in concert with a variety of diagnostic procedures to provide a quick and accurate diagnosis, allowing for proper and appropriate treatment. When one positive sample offers certainty identification before serologic conversion, zoonotic disease identification becomes increasingly reliant on PCR data. This frequently results in the loss of medical science-based infecting strain identification, which is epidemiologically important to locate reservoirs. As a result, the widespread use of PCR has substantially improved the first detection of leptospirosis [20]. Attempts should be made to develop simple, sensitive, specific and low cost test that can be routinely employed even by poor resource nations for the diagnosis of this enigmatic zoonosis of global public health significance.

## Treatment

The treatment of leptospirosis is also difficult because the pathogenesis of *Leptospia* has not been fully researched, making it difficult to detect the infection in its early stages. Antimicrobials clinical efficacy in treating both moderate and severe leptospirosis infection is similarly understudied and a source of debate [21].

The penicillin group is suggested by the WHO as the medicine of choice; however stronger antibiotics are frequently given in the hospital to widen coverage for the treatment of *Leptospira* as a first line of therapy. Leptospirosis has also been treated with cephalosporins, doxycycline, tetracycline and chloramphenicol [19,22].

## Prevention and control

Although there are numerous treatments available, it is always preferable to take preventative measures to limit the spread of illness and the possibility of recurrence in order to lower the mortality rate. In endemic areas, common prophylactic strategies include avoiding contact with rats, cattle, pigs, horses, and other domestic animals that are responsible for leptospiral infection transmission, as well as soil, agricultural fields, and water sources. Some asymptomatic carriers, such as rats, are resistant to infection; knowing this mechanism will aid in the implementation of an effective infection control approach [2,5].

Farmers, agricultural workers, freshwater sports people, and flood rescue volunteers can be taught how to utilize adequate protective clothing, such as gloves and boots, to avoid coming into contact with the infectious agent [19]. Immediate diagnosis and

prompt therapy is imperative in order to mitigate the suffering of the patient. The high risk groups in endemic areas are advised to take doxycycline as a chemoprophylaxis [11]. In addition, health education should be imparted to various occupational groups about the source of infection, mode of transmission, severity of disease, and environmental hygiene [19].

## Conclusion and Recommendations

Leptospirosis is considered an underestimated illness with current warming and temperature change that favor the growth of leptospirosis because of survival of leptospirosis throughout rainy seasons in warm-climate regions. Infections by this microorganism are extremely virulent, notably in poor countries because of an absence of hygiene. Clinical diagnosis of leptospirosis will be difficult as a result of clinical signs measure nonspecific.

Stringent or continued surveillance and monitoring of leptospirosis, as emerging agents is essential to learn more about these diverse serotypes and serovars, generally shed in urine of rodents and/or domestic animals, living in close proximity to one another in developing countries, for better understanding of transmission pattern of leptospires that circulate in different geographical locations.

For a better understanding of the transmission pattern of leptospires that circulate in different geographical locations, strict or ongoing surveillance and monitoring of leptospirosis, as emerging agents, is necessary to learn more about these diverse serotypes and serovars, which are generally shed in the urine of rodents and/or domestic animals living in close proximity to one another in developing countries. It is emphasized to undertake further studies on the pathogenesis, molecular epidemiology, diagnostics, and chemotherapy of leptospirosis that has emerged as an important public health problem.

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## Contribution of Authors

All the authors contributed equally. They read the final version, and approved it for the publication.

## Conflict of Interest

The authors declare that they do not have conflict of interest.

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