Leptospirosis

Last update: 2022-06-28

Key facts

To better understand public health terms included in this Disease Tool (e.g. What is a case definition? or What is an infectious agent?), consult our page on Key concepts on epidemiology.

Importance

Leptospirosis is a zoonotic disease and endemic in many countries, especially in tropical and subtropical areas with high rainfall. The disease is found mainly where humans come into contact with the urine of infected animals or a urine-polluted environment. Outbreaks of leptospirosis have been reported following natural disasters such as flooding or cyclones. The global burden of leptospirosis is expected to rise with demographic shifts that favour increases in the number of urban slum environments and due to climate change, increasing the number of flood disasters.

?

Case definition

A **case definition** is a set of uniform criteria used to define a disease for public health surveillance. It enables public health officials to classify and count cases consistently.

The following are standard case definitions to allow national health authorities to interpret data in an international context. However, during an outbreak case definitions may be adapted to the local context and the Red Cross Red Crescent should use those agreed/established by national health authorities. NB: Consider that during community surveillance, ***volunteers*** *should use broad (simplified) case definitions to recognize most or all possible cases and encourage them to seek care. Other actors such as* ***healthcare workers or investigators*** *studying the cause of a disease, on the other hand, can use more specific case definitions that may require laboratory confirmation.*

Recommended types of surveillance include immediate case-based surveillance to establish human health and veterinary response and control actions; in endemic areas, routine reporting of aggregated data of confirmed cases is also important. It is estimated that leptospirosis is under-reported in many countries due to the difficulties of clinical diagnosis and unavailability of diagnostic laboratory services.

Clinical description: The usual presentation is an acute febrile illness with headache, muscle pain (particularly calf muscle) and fatigue associated with any of the following symptoms/signs: red eyes, no or less urination, jaundice, cough, coughing blood and breathlessness, haemorrhages (from the intestines; lung bleeding is notorious in some areas), meningeal irritation, cardiac arrhythmia or failure, skin rash. Other common symptoms include nausea, vomiting, abdominal pain, diarrhoea and joint pain. The clinical diagnosis is difficult where diseases with symptoms similar to those of leptospirosis occur

frequently.

Case classification (humans)

Suspected: A case that is compatible with the clinical description and a presumptive laboratory diagnosis.

Confirmed: A suspect case with a confirmatory laboratory diagnosis.

WHO case definition source of information: https://www.who.int

Risk factors

- The disease occurs seasonally in countries with humid subtropical and tropical climates. In urban settings, epidemics are associated with high rainfall, while in rural areas epidemics are associated with harvest seasons.
- During a hurricane, flooding or heavy rain, animal urine in the soil or on other surfaces can run into floodwater, contaminating it. Streams and other natural water sources can also be contaminated. Cases of leptospirosis can increase during these disasters when people may have to wade through contaminated water or use it for drinking or bathing.
- Individuals living in urban slum environments characterized by inadequate sanitation and poor housing are at high risk of rat exposure infected by leptospira.
- Eating food that has been exposed to contaminated water or potentially urinated on by rodents.
- Drinking from potentially contaminated water sources, including floodwater, streams, rivers or unsafe tap water.

Occupational hazard for many people who work outdoors or with animals, such as:

- Farm and agricultural workers.
- Pet shop workers.
- Miners.
- Veterinarians.
- Sewer workers.
- Abattoir workers.
- Meat handlers.
- Military personnel.

Recreational hazard for those who participate in outdoor activities, such as:

- People engaging in recreational water sports (e.g, swimming, wading, kayaking).
- Campers.

?

Attack rate (AR)

The **attack rate** is the risk of getting a disease during a specific time period (such as during an outbreak).

Attack rates range from 5 per cent (e.g. AR: 5.95 per cent Orissa, India in 2002) to up to 50 per cent (e.g., AR: 41.3 per cent Thailand 1999) in past outbreaks.

Groups at increased risk of severe illness (most vulnerable)

- Mortality increases with age, particularly in patients older than 60 years of age.
- Pregnant women. people with chronic diseases such as renal disease, cancer, chronic lung or liver disease and diabetes.
- People with weakened immune systems such as those receiving chemotherapy, steroids, transplant recipients or HIV carriers.

?

Infectious agent

Infectious agents are bacteria, viruses, fungi, prions and parasites. A disease caused by an infectious agent or its toxic products is defined as an infectious disease.

Leptospira interrogans (bacterium).

?

Reservoir / host

A **reservoir of infection** is a living organism or material in or on which an infectious agent lives and/or usually multiplies. Reservoirs include humans, animals and the environment.

A **susceptible host** is a person at risk of being infected. The level of susceptibility depends on age, sex, ethnicity and genetic factors, specific immunity also depends on other factors that affect an individual's ability to resist infection or to limit its ability to cause infection.

A **zoonotic disease** or **zoonosis** is an infectious disease that has jumped from a non-human animal to humans.

Zoonotic disease: a variety of animals can spread leptospirosis, including rodents, dogs, cattle, buffaloes, horses, sheep, goat, pigs, dogs and wildlife.

Humans.

?

How disease is spread (modes of transmission)

Categorisation of **modes of transmission** varies from one agency to another. In addition, some infectious agents can be transmitted by more than one mode. A list of modes of transmission can be found in the key concepts to serve as guidance to better understand the diseases included in this website.

- **Contact transmission:** Through cuts and abrasions of the skin, or through the mucous membranes of the eyes, nose and mouth with water contaminated with the urine of infected animals. As animals are constantly in our environment, there is a particular danger of getting leptospirosis when flooding occurs, such as following a typhoon or very heavy seasonal rains, because of exposure to contaminated water when wading in floodwaters. Transmission can also occur by directly touching the urine from an infected animal .
- **Vehicle-borne transmission:** Leptospirosis can occasionally also be transmitted through the drinking of water or ingestion of food contaminated with urine of infected animals.
- **Sexual transmission:** Human-to-human transmission occurs only very rarely during sexual intercourse.
- **Congenital transmission:** Trans-placentally from the mother to the foetus and via breast milk to a child.

?

Incubation period

This time from when infection occurs to the onset of symptoms is called the **incubation period**. It is a range of days and it can be different for each disease.

Typically, between 5 to 14 days (range of 2—30 days).

?

Period of infectiousness

Period of infectiousness is the time interval during which an infected person can transmit the infection to other susceptible persons.

First seven to ten days of illness.

Clinical signs and symptoms

In general, the disease presents in four broad clinical categories:

- 90 per cent of the infected people present a mild, influenza-like illness: after around one week fever stops but then comes back for a second phase. Additional symptoms can be gastrointestinal pain, rash, redness of the conjunctiva. This category is often self-limited.
- A more severe illness affecting multiple organs: characterized by jaundice, renal failure, haemorrhage and infection of the heart muscle with arrhythmias (historically called Weil’s syndrome).
- Meningitis/meningoencephalitis.
- Pulmonary haemorrhage with respiratory failure.

Other diseases with similar clinical signs and symptoms

Influenza, dengue fever, hantavirus pulmonary syndrome, yellow fever and other haemorrhagic fevers, malaria and typhoid fever.

Diagnosis

The disease is usually diagnosed in the laboratory by detecting antibodies, (serodiagnosis), by culturing the bacteria from blood, urine or tissues, or by demonstrating the presence of leptospira in tissues using antibodies labelled with fluorescent markers.

Vaccine or treatment

Please refer to the appropriate local or international guidelines for clinical management. All clinical management including the administration of a treatment or vaccine should be conducted by a health professional.

- Leptospirosis can be treated with antibiotics that should be given as early in the course of illness as possible. No isolation is needed because there is almost no human-to-human transmission.
- Commercial human vaccines have been produced in certain countries providing a certain degree of protection. However, these vaccines have a high side-effect profile, do not induce long-term protection against infection and do not provide cross-protective immunity against the different types of leptospira. Until further studies are done, the human vaccine is not recommended by WHO.

?

Immunity

There are two types of immunity:
- **Active immunity** results when exposure to an agent triggers the immune system to produce antibodies to that disease.
- **Passive immunity** is provided when a person is given antibodies to a disease rather than producing them through his or her own immune system.

The level and duration of immunity is unclear and can vary.

Which interventions are most effective for prevention and control?

The following is a list of activities considered for Red Cross Red Crescent volunteers to take part in. It is not an exhaustive list of all prevention and control activities for the specific disease.

- Communicate risks about the disease or epidemic, not only to share information on prevention and mitigation measures, but also to encourage informed decision-making, positive behaviour change and maintenance of trust in the Red Cross Red Crescent response. This includes the identification of rumours and misinformation around disease—frequent during health emergencies—to manage them appropriately. Volunteers should use the most context-appropriate communication techniques (ranging from social media to face-to-face interactions).
- Community education and engagement activities to encourage the adoption of protective behaviours:
  - Preventing contact with rodents and their excrement
  - Maintaining hygiene at home and workplaces, e.g. by storing food in rodent-proof containers; disposing of rubbish/garbage away from the home; eliminate food or trash that may attract rodents around the home
  - Sealing any holes at home to reduce chances of rodents burrowing in.
  - Avoiding wading, swimming, bathing or swallowing floodwater or any fresh water that may contain animal urine.
- During outbreaks, encourage adoption of practices to interrupt transmission including the use of waterproof protective clothing, shoes or boots near floodwater or any fresh water source that may be contaminated with animal urine.
- Community-based environmental management and clean-up campaigns.
- To prevent infection in humans during an outbreak, health professionals may prescribe antibiotic prophylaxis to groups at higher risk of contracting the disease.

Which interventions have NO evidence and therefore are NOT recommended?

Leptospirosis is usually not transmitted from one human to another through direct contact. Therefore, there is no need for isolation of affected people.

Epidemic characteristics and RCRC indicators and targets

The first table below includes data that should be gathered from health authorities and relevant non-governmental actors to understand the progress and characteristics of the epidemic in the specific country and area of intervention. The second table includes a list of suggested indicators that can be used for monitoring and evaluating Red Cross Red Crescent activities; wording of indicators may be adapted to specific contexts. Target values for a specific indicator can vary widely from one context to another and therefore managers should define them based on the specific population, area of intervention and programmatic capacity. Exceptionally, some indicators in this website may include target values when these are globally agreed as a standard; e.g. 80 per cent of individuals who slept under an insecticide-treated net (ITN) the previous night—the normative World Health Organization benchmark for universal coverage with ITNs.

Epidemic characteristics and progression
Suspected cases per week (disaggregate by age, sex)
Confirmed cases per week (disaggregate by age, sex)

Epidemic characteristics and progression
Case fatality rate
Red Cross Red Crescent activities
Number of volunteers trained on a specific topic (e.g. Epidemic Control for Volunteers (ECV); Community-based surveillance (CBS); WASH training; CBHFA training, etc.) ***Numerator*:** Number of volunteers trained Source of information: Training attendance sheets
Suspect cases detected by volunteers who were encouraged to seek healthcare and who arrived at a health facility *(NB. This indicator requires the implementation of a system in collaboration with the health facility, whereby health workers specifically asked the patient how they heard about the service)* ***Numerator:*** Leptospirosis suspect cases detected by volunteers in a determined period preceding this survey (e.g. two weeks) for whom advice or treatment was sought from a health facility ***Denominator:*** Total number of people who are leptospirosis suspect cases in the same period preceding the survey Source of information: Survey
Percentage of people recognizing at least one transmission route and at least one measure for preventing it ***Numerator*:** Total number of people who recognized at least one transmission route and at least one measure for preventing it during the survey ***Denominator*:** Total number of people surveyed Source of information: Survey
Percentage of people who know the cause, symptoms, treatment or preventive measures ***Numerator*:** Number of people who cite the cause, symptoms, treatment or preventive measures ***Denominator*:** Number of people surveyed Source of information: Survey

Impact on other sectors

Sector	Link to the disease
WASH	Proper personal and environmental hygiene and sanitation measures to discourage rodents from entering homes decrease transmission of leptospirosis. Treating drinking water sources that may be contaminated and washing hands with soap after contact with contaminated urine or water are effective prevention strategies.
Food security	Leptospira can be transmitted via contaminated food with urine of infected animals (often rats). Rodent-proof water and food storage containers are an effective prevention measure.

Sector	Link to the disease
Nutrition	Malnutrition increases the risk of severe leptospirosis.
Shelter and settlements (including household items)	As the bacterium leptospira is endemic in heavy rainfall regions and increases during flooding, the position of shelters and settlements outside of potentially flooded areas is important to prevent infections. Flood control projects are simultaneously preventing the disease and protecting the settlements. Another important prevention measure is rodent control by maintaining clean households and good waste management (e.g. rodent-proof dwellings and buildings, rodent-proof containers, disposing of garbage far from home).
Psychosocial support and mental health	Leptospirosis can have several negative impacts on psychological, social and emotional aspects of a person's life, apart from its physical effects only. Psychological reactions may include anxiety and worry about the outcome for severe cases. Outbreaks often occur during and after disasters like typhoons and floods which can limit the resilience of people affected and worsen mental health.
Education	When schools do not have clean running water, good food and garbage management and rodent control measures, this can increase the number of rodents and add transmission risks in places where leptospirosis is endemic. Children may then be at risk of getting the disease if attending classes, or at risk of losing out on education if staying at home because of illness. Children often play in the water, therefore they are at increased risk for leptospirosis.
Livelihoods	Leptospirosis is amongst others an occupational hazard. Therefore, some working activities like farmers, sewer workers, miners, slaughterers or fishers are more exposed to the disease. This can lead to reduction in productivity and loss of income due to reduction in work activity and to the diversion of resources to seek medical treatment. Individuals living in urban slum environments characterized by inadequate sanitation and poor housing are at high risk of rat exposure infected by leptospira and of living in potentially flooded areas, exposing them to leptospirosis.
Sex and gender	The incidence of leptospirosis is often reported to be much higher in males than females. This could be related to exposure-related bias as occupational hazards are fields of work mostly done by men.

Resources:

- Bhusan Jena, A., Mohanty, K. A., Devadasan, N. (2004) An outbreak of leptospirosis in Orissa, India: the importance of surveillance. *Tropical Medicine & International Health*, volume 9 no 9 pp 1016–1021.https://doi.org/10.1111/j.1365-3156.2004.01293.x
- Dierks J, Servies T, Do T. (2018) A Study on the Leptospirosis Outbreak Among US Marine Trainees in Okinawa, Japan. Mil Med. Mar 1;183(3-4):e208-e212. doi: 10.1093/milmed/usx013. PMID: 29514334.
- Haake, D. A., & Levett, P. N. (2015). Leptospirosis in humans. *Current topics in microbiology and immunology*, *387*, 65–97. https://doi.org/10.1007/978-3-662-45059-8_5
- WHO (2003) *Human leptospirosis : guidance for diagnosis, surveillance and control*. Available at:

https://apps.who.int/iris/handle/10665/42667

- Phraisuwan, P., Whitney, E. A., Tharmaphornpilas, P., Guharat, S., Thongkamsamut, S., Aresagig, S....Ashford, D. A. (2002). Leptospirosis: Skin Wounds and Control Strategies, Thailand, 1999. *Emerging Infectious Diseases*, *8*(12), 1455-1459. https://doi.org/10.3201/eid0812.020180
- WHO (2003) *Human leptospirosis : guidance for diagnosis, surveillance and control*. Available at: https://www.who.int/csr/don/en/WHO_CDS_CSR_EPH_2002.23.pdf
- WHO (2006) Informal Consultation on Global Burden of Leptospirosis: Methods of Assessment Geneva, 25-27 October 2006. Available at: https://www.who.int/foodsafety/zoonoses/InformalConsultationOnBoDLeptospirosis.pdf
- WHO.(2009) *Leptospirosis: Fact Sheet*. WHO Regional Office for South-East Asia. Available at: https://apps.who.int/iris/handle/10665/205437