



Leptospirosis

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History

- Early Descriptions: The disease was described in ancient Chinese texts as "rice field jaundice" and in Japan as "autumn fever" or "seven-day fever".
- 1886: Adolf Weil reported "acute infectious disease with enlargement of spleen, jaundice, and nephritis," later known as Weil's disease.
- 1907: Arthur Stimson first observed the bacteria in a post-mortem kidney tissue slice, naming it *Spirochaeta interrogans* due to its question-mark shape.
- 1915: Japanese researchers (Inada and Ido) identified the causative organism, its transmission, and pathology, while similar discoveries were made independently by German researchers.
- 1917: The role of rats as carriers was established.
- 1933: *Leptospira canicola* was isolated, confirming dogs as carriers.



Introduction

- Worldwide zoonosis caused by pathogenic spirochetes of the genus *Leptospira*.
- The most common zoonotic infection globally.
- In children specifically, clinical presentations are often nonspecific, leading to frequent misdiagnosis and delayed treatment.
- Global estimates place the annual burden at approximately 1.03 million cases and 58,900 deaths worldwide.
- Greatest burden in tropical and subtropical regions.



1. Costa F, Hagan JE, Calcagno J, et al. Global Morbidity and Mortality of Leptospirosis: A Systematic Review. *PLoS Negl Trop Dis* 2015; 9:e0003898.

2. Torgerson PR, Hagan JE, Costa F, et al. Global Burden of Leptospirosis: Estimated in Terms of Disability Adjusted Life Years. *PLoS Negl Trop Dis* 2015; 9:e0004122.

3. Döneray, Hakan et al. "Pediatric Leptospirosis: A Case Report and Review of Literature." *The Eurasian journal of medicine* vol. 55,1 (2023): 150-156. doi:10.5152/eurasianjmed.2023.23380

Causative agent

It can be distinguished morphologically from other spirochetes by its unique "question mark" hook at the end of the bacterium



Epidemiology

- Highest incidence in South and Southeast Asia, Oceania, the Caribbean, Latin America, and Sub-Saharan Africa.
- Has a seasonal pattern, with outbreaks strongly associated with the rainy season and flooding events.
- Children are notably at risk: a population-based study from Chennai, India, found that 26.1% of clinically suspected paediatric cases were laboratory-confirmed.



Leptospirosis in Mauritius

- Current Situation (2026): As of 23 April 2026, 15 cases and 4 deaths have been recorded, indicating an upward trend.
- In 2025, there were 41 reported cases and 9 deaths.
- In 2024, after cyclone Belal, there was 80 reported cases and 18 deaths of which 12 directly attributable to leptospirosis.



Leptospirosis in Reunion island

[Acute leptospirosis in children in Reunion Island: a retrospective review of 16 cases]

[Article in French]

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Affiliations + expand

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Abstract

Introduction: Leptospirosis is a worldwide zoonosis caused by pathogenic species of the genus *Leptospira*. This infectious disease known with a high incidence in Reunion island (French overseas territories in Indian Ocean) is in state of endemia especially during rains season.

Objectives: The aim of our work was to identify the mains epidemiologic, clinical, biological, and therapeutic features of leptospirosis in children.

Population and methods: We conducted a retrospective analysis of children hospitalized in pediatric unit with the diagnosis of leptospirosis from January 2001 to June 2004 in general hospital of Saint-Denis. We found out 16 cases (mean age 14 years, range 9-17), mainly boys (ratio 7:1).

Results: The patient sera reacted most strongly with *Leptospira interrogans* serovars *canicola* (66%), *icterohaemorrhagiae* (17%), and *sejroe* (17%). Epidemiologic data indicated contact with contaminated water in most cases (68%). Jaundice was present in 43% of the patients, increased transaminase levels in 56%, renal failure in 50%, meningitis in 25%, ECG abnormalities in 6%, respiratory manifestations in 6%, systemic manifestations in 12% and thrombocytopenia in 56%. Death rate was zero, but renal failure is likely to induce life prognosis.

Discussion: The diagnosis' traps are numerous, leading to an underestimation and underdiagnosis of the leptospirosis, more over there is a lack in specific, reliable, and quick biological test to make the diagnosis. A negative polymerase chain reaction analysis (PCR) do not exclude the diagnosis, and the microagglutination test (MAT) remains the reference of the undoubtedly diagnosis of leptospirosis. It appears that it is more often the conjunction of epidemiologic data (young boy, swimming or fishing in river, rains season), with clinical and biological data that lead to the diagnosis. Diagnosis was not evoked at the emergency room in 37% of the patients.

Human Leptospirosis on Reunion Island, Indian Ocean: Are Rodents the (Only) Ones to Blame?

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Abstract

Conclusions/Significance

Our data confirm rats as a major reservoir of *Leptospira* on Reunion Island, but also pinpoint a possible role of dogs, cows and mice in the local epidemiology of human leptospirosis. This study shows that a comprehensive molecular characterization of pathogenic *Leptospira* in both clinical and animal samples helps to gaining insight into leptospirosis epidemiology within a specific environmental setting.

Epidemiology

Animal reservoir – Approximately 160 mammalian species are natural carriers of pathogenic *Leptospira* species.

- The organism lives in the renal tubules of infected mammals and is shed in the urine.
- Rodents are the most important reservoirs for maintaining transmission.
- Infection in small rodents (eg, rats) usually occurs in utero, during birth, or during infancy from environmental contamination of the nest.
- Once infected, rodents are asymptomatic carriers and shed the organism in their urine intermittently or continuously throughout life, contaminating the environment, particularly water.



Epidemiology

- Animal reservoirs: Apart from rodents, the organism infects a variety of both wild and domestic mammals, especially cattle, swine, dogs, horses, sheep, and goats.
- It rarely occurs in cats.
- Animals can be asymptomatic carriers or can develop clinical infection, which may be fatal.
- Mortality in dogs is estimated at approximately 10 %.
- Spontaneous abortion is a common outcome of leptospirosis in cattle, swine, sheep, and goats.



Epidemiology

- Environmental reservoir – can survive for days to months in urine-contaminated soil and fresh water.
- Contamination of water with animal urine can occur via several mechanisms:
 - Following heavy rainfall or flooding
 - ☐ that allows mixing of urine-contaminated soil or sewage with water in areas with poor housing and sanitation/sewage conditions that propagate high rodent populations
 - Animal excretion of urine into wet soil or bodies of fresh water, such as ponds, lakes, rivers, and streams
 - Drainage of urine-contaminated soil or water into bodies of fresh water

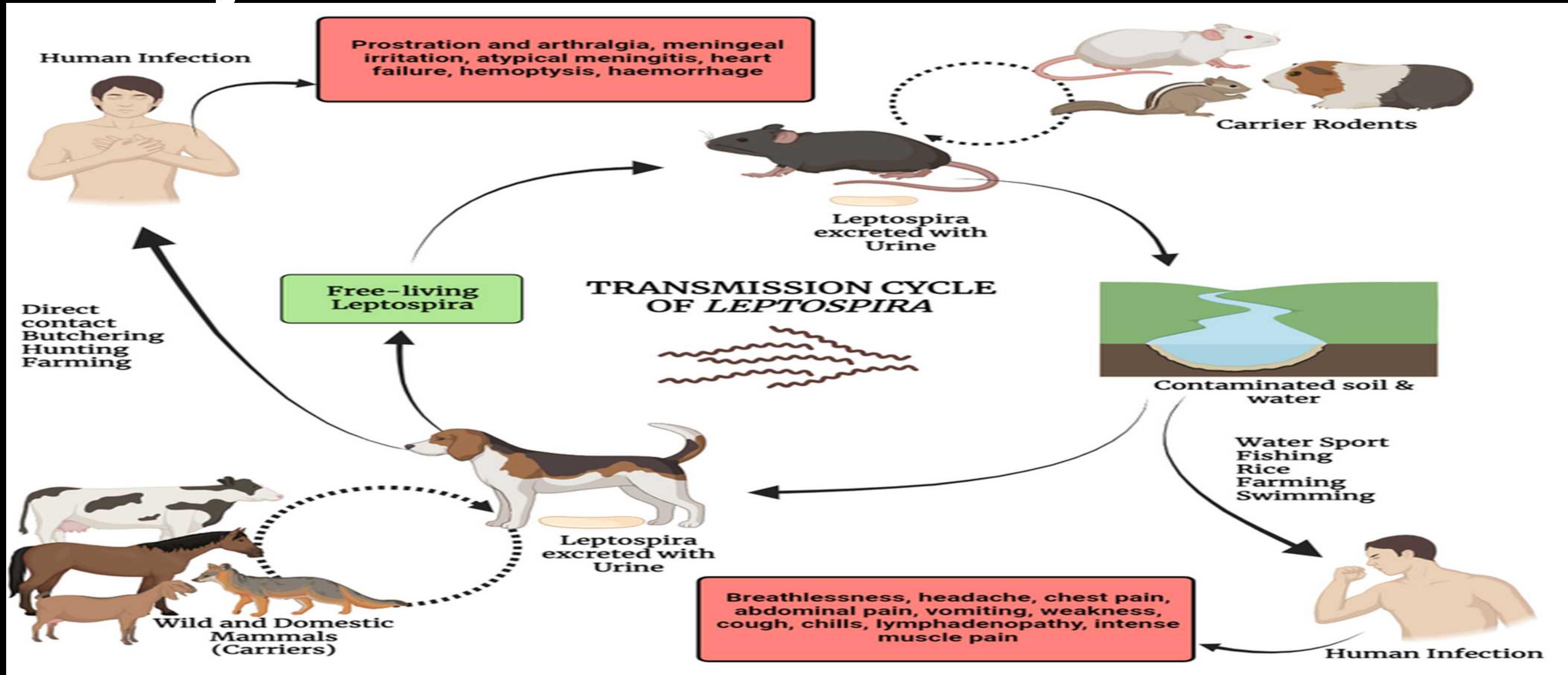


Transmission to humans

- Humans are accidental hosts, infected incidentally after animal or environmental exposure.
- Transmission occurs via portals of entry, including cuts or abraded skin, mucous membranes, or conjunctivae.
- Human exposures that lead to infection include:
 - contact with urine-contaminated soil or water (eg, floodwater, ponds, rivers, streams, sewage),
 - ingestion of food or water contaminated by urine
 - direct contact with the urine or reproductive fluids from infected animals.
- Transmission rarely through animal bites.
- Controversy exists as to whether *Leptospira* can penetrate intact skin.
- Human-to-human transmission very rare but documented through sexual intercourse and breastfeeding.



Life cycle



Animal and environmental reservoirs — Mammals act as the primary reservoir for Leptospira organisms. The environment serve as a reservoir once contaminated by the urine of infected mammals

Key epidemiological risk factors in children include

- Rat infestation.
- Contact with contaminated water (stagnant water, floodwater, rivers, paddy fields)
- Rural residence and outdoor recreational activities
- Exposure to animals (dogs, cattle, rodents)



Outbreaks

- Tend to occur after heavy rainfall or flooding in endemic areas, especially in areas with poor housing and sanitation conditions.
- In 2022, an outbreak was reported in Tanzania among farmers.
- Several outbreaks around the world in participants in triathlons where the swimming portion was in fresh water.
- Among adventure race participants in a swamp in Florida.
- In 2018, an outbreak in northern Israel was associated with recreational water exposure.



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Clinical Course

- The clinical course in children variable, ranging from subclinical infection to severe, life-threatening disease.
- Syndromes caused by leptospirosis: anicteric and icteric leptospirosis.
- Icteric leptospirosis is the more severe form of disease.
- Anicteric leptospirosis in most of symptomatic patients.



Anicteric Leptospirosis

- Anicteric leptospirosis is a biphasic illness, with an acute phase and an "immune" phase.
- Acute phase (first week of illness):
 - typically lasts 2 - 9 days.
 - begins 5 to 14 days after exposure, although the incubation period can range from 2 to 30 days.



Anicteric acute phase clinical features:

- Abrupt onset of fever, rigors, myalgias (especially in the calves and lower back), and headache; occur in 75 to 100% of patients.
- Approximately half of patients experience nausea, vomiting, and diarrhea, and nonproductive cough occurs in 25 to 35% of cases.
- Conjunctival hyperemia ('suffusion) in most of patients with leptospirosis in some case series.
- *Acalculous cholecystitis and pancreatitis have been described in children.*



Anicteric Leptospirosis: Immune phase

- “Delayed phase of illness
- Characterized by specific immune-mediated complications.
- The immune phase typically lasts around 1 week, and no longer than 30 days, except for ophthalmologic complications.
- Leptospire are absent from the blood, and antibodies to the organism are present.
- The organism may be detectable in the urine during this phase.



Clinical Presentation: Immune phase

Systemic symptoms – begins with renewed fever, headache, and myalgia.

- Aseptic meningitis – hallmark of the immune phase, with headache and neck pain or stiffness in approximately half of patients.

- Meningitis symptoms subside within 1-2 days and rarely persist up to three weeks.

- CSF findings: neutrophilic or lymphocytic pleocytosis with mildly elevated protein and normal glucose.

- Uveitis – Unilateral or bilateral uveitis and may be recurrent.

- The most common: anterior uveitis (ie, iritis, iridocyclitis).

- Typically have a good prognosis .



Common clinical features in children

Feature	Frequency Range (across paediatric series)/%
Fever	55-100
Headache	24-33
Myalgia	24-72
Conjunctival suffusion	8-62
GIT symptoms	8-66
Jaundice	14-84
Hepatomegaly	4-72
Renal dysfunction	17-60
Meningitis	2-25
Myocarditis	1-9%



Icteric Leptospirosis: Weil's Disease

- The severe classic form is characterized by jaundice, AKI and pulmonary haemorrhage.
- Paediatric leptospirosis exhibits a higher frequency of classic Weil's disease features compared to adults in some series.
- Occurs in approximately 5 to 10% of symptomatic leptospirosis cases
- It is a rapidly progressive multisystem illness associated with mortality rates of 5 to 15 %.



Weil's Disease

- Pulmonary haemorrhage: most feared complication.
- Mortality exceeding 50% in leptospirosis-associated pulmonary haemorrhagic syndrome (LPHS).
- Myocarditis with ECG abnormalities
- Rhabdomyolysis
- Hepatic findings – Conjugated bilirubin elevated with normal or slightly elevated aminotransferases
- Vasculitis with necrosis of extremities seen in severe cases, including in children



Weil's Disease

- Liver failure is rare
 - liver enzymes and bilirubin abnormalities resolve without permanent liver damage.
- Renal failure may be oliguric or non-oliguric.
 - Hyponatraemia and hypokalaemia: Leptospira outer membrane proteins inhibiting the $\text{Na}^+ - \text{K}^+ - \text{Cl}^-$ cotransporter in the renal tubule.
 - Supportive renal replacement therapy may be required for survival in up to half of patients.
 - Complete renal recovery is typical after discontinuation of renal replacement therapy.



Pregnancy

- Leptospirosis in pregnancy may be misdiagnosed as it can mimic other pregnancy-associated conditions, including:
 - other infections
 - pregnancy-associated hypertension
 - acute fatty liver
 - HELLP syndrome.



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25.Carles G, Montoya E, Joly F, Peneau C. [LeptospirShaked Y, Shpilberg O, Samra D, Samra Y. Leptospirosis in pregnancy and its effect on the fetus: case report and review. Clin Infect Dis 1993; 17:241.

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Pregnancy

- Transplacental infection occurs, but the rate of fetal transmission and the type and frequency of fetal complications are unknown.
- In a systematic review, 35 cases of leptospirosis in pregnancy were identified, resulting in four parental deaths and 20 abortions/fetal deaths.
- Information on sequelae in surviving neonates is sparse.



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25. Carles G, Montoya E, Joly F, Peneau C. [Leptospirosis in pregnancy and its effect on the fetus: case report and review. *Clin Infect Dis* 1993; 17:241.

26. Leptospirosis and pregnancy. Eleven cases in French Guyana]. *J Gynecol Obstet Biol Reprod (Paris)* 1995; 24:418.

Leptospirosis in neonates

- Leptospirosis in neonates is rare but dangerous, resulting from maternal infection during the last trimester, which can cause miscarriage, stillbirth, or congenital infection.
- Neonates may present with nonspecific symptoms like fever and lethargy or severe manifestations, including jaundice, kidney dysfunction, and hemorrhage.
- Key Aspects of Neonatal Leptospirosis
Transmission: While rare, transmission can occur in utero, during birth, or potentially via breastmilk.



27. Hope, Derick et al. "Prevalence of anti-leptospiral IgM and detection of pathogenic *Leptospira* species DNA in neonates presenting with clinical sepsis in Southwestern Uganda." *European journal of medical research* vol. 27,1 268. 2 Dec. 2022, doi:10.1186/s40001-022-00902-w

28. Tomari K, Toyokawa T, Takahashi T, et al. Childhood leptospirosis in an industrialized country: Population-based study in Okinawa, Japan. *PLoS Negl Trop Dis*. 2018;12(3):e0006294. Published 2018 Mar 8. doi:10.1371/journal.pntd.0006294

Leptospirosis in neonates

- Congenital vertical transmission is more likely to occur in the third trimester a stage when the IgG level transmitted to the fetus from the mother just begins to increase and at the same time when fetal plasma cells are fully developed.
- Antigen-specific antibody response can be mounted in both prenatal and neonatal life but at a lower intensity.
- There has been evidence that leptospirosis can be vertically transmitted though rarely.



27. Hope, Derick et al. "Prevalence of anti-leptospiral IgM and detection of pathogenic *Leptospira* species DNA in neonates presenting with clinical sepsis in Southwestern Uganda." *European journal of medical research* vol. 27,1 268. 2 Dec. 2022, doi:10.1186/s40001-022-00902-w

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Leptospirosis in neonates

- Symptoms: Neonates might show fever, jaundice, oliguria, vomiting, and respiratory distress.
- Diagnosis: Often missed due to nonspecific symptoms, it requires high clinical suspicion
- Treatment involves antibiotics such as penicillin or cephalosporins.
- Early diagnosis and prompt antibiotic treatment are critical for positive outcomes.
- Prognosis: Severe disease in young children may require intensive care, with a 5% to 15% mortality rate in severe cases.



27. Hope, Derick et al. "Prevalence of anti-leptospiral IgM and detection of pathogenic *Leptospira* species DNA in neonates presenting with clinical sepsis in Southwestern Uganda." *European journal of medical research* vol. 27,1 268. 2 Dec. 2022, doi:10.1186/s40001-022-00902-w

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Leptospirosis in neonates

- **Foetal outcomes:**
 - IUFD (intrauterine fetal death)
 - Miscarriages.
 - Stillborn.
 - Prematurity.
 - Neonatal death though rare.



Investigate when

- The combination of:
 - fever
 - conjunctival suffusion
 - Thrombocytopenia
 - Renal/hepatic dysfunction
 - with exposure history should prompt strong consideration of leptospirosis in a child.



Investigations

- Routine laboratory findings in children are non-specific but include:
 - Haematology: leukocytosis, neutrophilia, thrombocytopenia or pancytopenia; anaemia.
 - Biochemistry: elevated transaminases (ALT/AST), hyperbilirubinemia, elevated creatinine, elevated creatine kinase (in ~50% of cases), hyponatraemia, hypokalaemia.
 - Elevated creatine kinase is a useful diagnostic indicator of leptospirosis.
 - Urinalysis: proteinuria, pyuria, granular casts, microscopic haematuria
 - Coagulation: elevated D-dimer, prolonged PT/INR in severe cases
 - Inflammatory markers: markedly elevated CRP, procalcitonin



Investigations

- A combination of methods is typically required:
- Microscopic Agglutination Test (MAT): gold standard for serology; identifies serovar; requires paired acute/convalescent sera; may be negative early in infection.
- ELISA IgM: widely used; detectable from the end of the 1st week; can cross-react with other infections. (syphilis/Lyme/Legionella)



Investigations

- Real-time PCR: highly sensitive and specific (PCR positivity ~28.4%, specificity 96% in one paediatric study); detects *Leptospira* DNA in blood early and in urine from days 4–7.
- Dark-ground microscopy: rapid method demonstrating motile spirochetes in urine; useful when PCR is unavailable.
- Culture: definitive but slow (weeks) and low yield (successful in 5–50%).



Differential Diagnosis

- Dengue fever
- Malaria
- Enteric fever (typhoid)
- Scrub typhus / rickettsial diseases
- Viral hepatitis
- Hantavirus infection
- Staphylococcal toxic shock syndrome
- Chikungunya / other arboviruses
- Measles



Treatment in Pregnancy

- Either azithromycin (500 mg orally once daily for three days) or amoxicillin (25 to 50 mg/kg in three equally divided doses [maximum 500 mg/dose] for seven days).
- Azithromycin is preferred over amoxicillin if the differential diagnosis includes rickettsial infection.



Treatment in Children

- Most cases have a self-limited course, but early antibiotic therapy reduces severity and complications, particularly in renal failure and thrombocytopenia.
- Mild/Outpatient Disease in children:
 - Doxycycline: 2 mg/kg/day in 2 divided doses (max 200 mg/day) orally for 7 days — contraindicated under 8 years of age.
 - Azithromycin: 10 mg/kg on day 1 (max 500 mg), then 5 mg/kg/day (max 250 mg/day) for 5–7day



Treatment in children

- Hospitalised/Severe Disease (IV therapy)
 - Penicillin G: 250,000–400,000 units/kg/day in 4–6 divided doses (max 6–12 million units/day)
 - Ceftriaxone: 80–100 mg/kg/day once daily (max 2 g/day)
 - Cefotaxime: 100–150 mg/kg/day in 3–4 divided doses.
 - Doxycycline IV: 4 mg/kg/day in 2 divided doses (max 200 mg/day)
- Recommended treatment duration for severe disease is 7 days.
- Supportive care may include:
 - Fluid-electrolyte correction, blood products, vasopressors, ventilatory support, and renal replacement therapy.
 - Corticosteroids may be considered in pulmonary involvement.



Complications

- Acute kidney injury
- Acute hepatic dysfunction (Weil's disease)
- Pulmonary haemorrhage / ARDS
- Myocarditis
- Meningitis / encephalitis
- Disseminated intravascular coagulation (DIC)
- Septic shock.



Prognosis

- Mortality in hospitalized pediatric patients ranges from 1.6% to 8%, with pulmonary haemorrhage and haemodynamic instability being the strongest predictors of death.
- In one Brazilian series of 43 hospitalised children, three developed pulmonary haemorrhage with respiratory failure and one died.



Prevention

- There is no widely available human vaccine for leptospirosis (commercial vaccines exist only in Japan, China, Cuba, and France).
- Prevention strategies include:
 - Rodent control
 - Flood control and avoidance of stagnant/contaminated water
 - Protective footwear in endemic areas
 - Public health education
 - Improved sanitation
 - Awareness among healthcare professionals to avoid misdiagnosis



Key Takeaways

- Paediatric leptospirosis is a globally important yet underdiagnosed zoonosis with a wide clinical spectrum.
- The non-specificity of symptoms in children, combined with limited clinician awareness and diagnostic access in endemic settings, results in delayed treatment and increased morbidity.
- Early clinical suspicion — particularly in febrile children with conjunctival suffusion, myalgia, and relevant exposure history — combined with prompt PCR or serology testing and early antibiotic initiation, is critical to improving outcomes.



WARNING!

LEPTOSPIROSIS HAZARD!



WEAR PPE



WATCH FOR RATS



**SEE A DOCTOR
IF SICK**

**AVOID
CONTAMINATED
WATER!**

SYMPTOMS:

FEVER, HEADACHE, MUSCLE PAIN