



FREQUENCY DISTRIBUTION AND EPIDEMIOLOGICAL IMPORTANCE OF *LEPTOSPIRA* SEROVARs GLOBALLY AND IN INDIA: A REVIEW

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Abstract

Leptospirosis is a globally distributed zoonotic disease caused by pathogenic *Leptospira* species. The variability in circulating serogroups/serovars influences disease epidemiology, diagnosis, and prevention strategies. Worldwide, more than 300 serovars have been identified, with ongoing discoveries due to advances in genomic sequencing and environmental surveillance. This review highlights major pathogenic serovars affecting human and animal health across the globe, and compares them with regional serovar prevalence patterns in India. The review further emphasizes the impact of environmental factors, reservoirs, and human–animal interactions on transmission. Strengthening serovar-specific surveillance and incorporating locally dominant serogroups in diagnostic assays are vital to reduce the burden of leptospirosis.

Keywords: Leptospirosis, *Leptospira* serovars, epidemiology, serogroups, India, zoonoses

Introduction

Leptospirosis is a neglected tropical disease caused by pathogenic *Leptospira* spp., characterized by a wide range of clinical manifestations from subclinical infection to multiorgan failure¹. Globally, over one million cases and nearly 60,000 deaths occur annually, mostly in tropical regions with poor sanitation². The complexity of the disease arises from the antigenic diversity of *Leptospira* species: traditionally classified into **serovars** and **serogroups**, now complemented by molecular typing³.

Serovar distribution patterns vary widely based on geography, reservoir animals, climate, and environmental changes, making epidemiological mapping a critical surveillance tool⁴. In India, climatic conditions, monsoon floods, and high rodent populations contribute significantly to disease endemicity⁵.

This review summarizes worldwide serovar distribution and compares prevalent serovars in different regions of India with global trends.

Materials and Methods

This narrative review analyzed data from peer-reviewed articles, reference textbooks, and international surveillance reports on *Leptospira* taxonomy, serovar discovery, reservoir ecology, and

human outbreaks. Studies focused on both global prevalence and Indian serovar-specific findings were included. References were selected based on epidemiological relevance.

Global Distribution of *Leptospira* Serovars

More than 38 *Leptospira* species have been identified due to genomic advances^{6–7}. Pathogenic serovars are unevenly distributed worldwide:

Region	Common serovars reported	Major reservoirs
Southeast Asia	Icterohaemorrhagiae, Copenhageni, Bataviae, Australis	Rats, dogs
Latin America	Canicola, Pomona, Grippityphosa	Rodents, cattle
Europe	Bratislava, Pomona	Domestic pigs, horses
Africa	Tarassovi, Hardjo, Hebdomadis	Cattle, rodents

Rapid environmental changes, urbanization, and expansion of livestock trade contribute to emergence of new species⁸. Soil surveillance has led to identification of multiple novel pathogenic species⁹.

Reservoir Ecology

Leptospira persists in renal tubules of reservoir animals including:

- Rodents — primary source for urban outbreaks¹⁰
- Dogs, cattle, pigs — occupational exposure¹¹
- Wildlife in forested/rural zones²

Humans acquire infection through contact with contaminated soil or water.

India-Specific Serovar Epidemiology

India records thousands of laboratory-confirmed leptospirosis cases each year, with large outbreaks during monsoon². Serovar profiles vary significantly by region:

Region (India)	Dominant Serogroups / Serovars	Main Host
Kerala	Australis, Autumnalis, Pomona, Canicola ¹²	Rodents, dogs
Tamil Nadu	Icterohaemorrhagiae, Grippityphosa ¹³	Rats
Andaman & Nicobar Islands	Autumnalis, Pyrogenes ¹⁴	Rodents
Uttar Pradesh	Icterohaemorrhagiae, Sejroe ¹⁵	Cattle
Maharashtra	Canicola, Javanica, Hardjo ¹⁶	Rodents, cattle
Karnataka	Hebdomadis, Pomona ¹⁷	Livestock

The **Icterohaemorrhagiae–rodent** association remains major across states.

Studies show pediatric leptospirosis linked with Autumnalis and Sejroe serogroups¹⁸.

Emergence of Novel and Localized Serovars

Some Indian investigations report new or localized serovars such as one from Kerala cattle¹². Intensive livestock farming and increasing wildlife–human interface contribute to dynamic serovar shifts.

Serovar Diversity and Diagnostic Implications

MAT (Microscopic Agglutination Test) remains the gold standard for serogroup/serovar identification, but its accuracy depends on inclusion of locally circulating strains¹⁹. Absence of region-specific panels may result in diagnostic underreporting²⁰.

Hence, **surveillance systems must constantly update strain libraries**.

Pathogenicity and Public Health Impact

Clinical severity differs among serogroups:

- **Icterohaemorrhagiae** — severe icteric disease & pulmonary hemorrhage²¹
- **Pomona & Hardjo** — reproductive losses in livestock affecting economy²²
- **Grippotyphosa** — classical febrile–renal syndrome²³

Early detection and serovar-specific management strategies are essential to reduce morbidity.

Future Directions

- Expand molecular surveillance using MLST & genome sequencing⁷
- Strengthen environmental screening in high-risk areas⁹
- Incorporate regional antigens in vaccines and diagnostic panels²⁴
- Improve animal reservoir control strategies²⁵

Conclusion

Leptospira serovar distribution exhibits significant geographical heterogeneity globally and within India. Rodent-associated serovars persist as dominant agents of disease burden. Surveillance-based diagnostic updates incorporating region-specific serovars, genomic typing, and One-Health strategies are critical for effective leptospirosis control.

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