

# Seasonal variation and clinical and epidemiological aspects of human leptospirosis in the city of Itaperuna – RJ

## *Variação sazonal e aspectos clínico-epidemiológicos da leptospirose humana na cidade de Itaperuna – RJ*

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### ABSTRACT

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Leptospirosis is a bacterial disease of global distribution and multiple presentations ranging from an unapparent process to lethal forms. The main reservoir of this anthro-pozoonosis, whose causing microorganism is the *Leptospira* sp., is a rodent associated with poor sanitation conditions. Floods and heavy rainfall are great sources that favor man's contact with contaminated water and are directly related to seasonal higher incidence of this disease and its strong association with professional activities. This qualitative and quantitative study was conducted based on the analysis of medical records from the Epidemiological Surveillance from the Health Secretary of Itaperuna-RJ, during the months of February and March 2012, and included data from the last three years. There was no direct relationship between disease incidence and the period of flooding; the lethality rate found proved to be superior to that reported in the literature and the domestic profession was the most affected. The importance of prioritizing primary prevention is reinforced for the management of leptospirosis and prevention of new cases.

**Key words:** Bacterial Infections; Leptospirosis; Leptospirosis/epidemiology; Spirochaeta.

### RESUMO

*A leptospirose é uma doença bacteriana de distribuição global e apresentação múltipla, variando desde um processo inaparente até formas letais. O principal reservatório dessa antropozoonose, cujo microrganismo causador é a Leptospira sp., é o roedor, associado a condições precárias de saneamento básico. As enchentes e as chuvas fortes constituem, em nosso meio, grande fonte favorecedora do contato do homem com as águas contaminadas e tem relação direta com a maior incidência sazonal da doença, bem como forte ligação com a atividade profissional. Esse estudo de caráter qualiquantitativo foi realizado com base na análise de prontuários da Vigilância Epidemiológica da Secretaria de Saúde de Itaperuna-RJ, durante os meses de fevereiro e março de 2012, e incluiu dados dos três últimos anos. Não houve relação direta entre a incidência da doença e o período de enchentes; a taxa de letalidade encontrada mostrou-se superior aos dados literários e a profissão doméstica foi a mais acometida. Reforça-se, então, a importância de priorizar a prevenção primária no manejo da leptospirose como forma de evitar novos casos.*

*Palavras-chave:* Infecções Bacterianas; Leptospirose; Leptospirose/epidemiologia; Espiroqueta.

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### INTRODUCTION

Leptospirosis is an emerging infectious multisystemic anthro-pozoonosis caused by pathogenic leptospirae, characterized by broad spectrum of clinical manifesta-

tions, ranging from unapparent infection to fulminant and fatal disease of worldwide distribution.<sup>1, 2</sup> Leptospirae are obligatory aerobic spirochetes, divided into two species: *L. interrogans* and *L. biflexa*; the former being the holder of the four sorovars responsible for most cases of illness in humans.

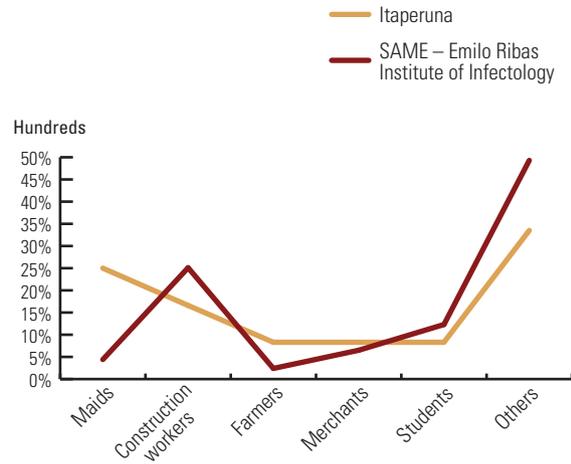
This disease is, at first, an infection in domestic and wild animals, mainly rats, dogs, cattle, and pigs.<sup>3</sup> Human infection may occur directly, through infected animal urine or indirectly through contaminated water or soil. The penetration of the micro-organism occurs through broken skin or skin fully immersed for long periods on contaminated water, and through mucous membranes (mainly oral, nasal, or conjunctival).<sup>4</sup>

The classic form of leptospirosis draws attention not only by the sharp toxemia but also the presence of rubinic jaundice (evidenced between the 3<sup>rd</sup> and 7<sup>th</sup> days), derived from a mixture of vascular alterations and tissue biliary impregnation. The disease is biphasic, being the first named septicemic and evidenced by high fever, chills, headache, myalgias (mainly in the calves, back, and abdomen), anorexia, nausea, and vomiting. Diarrhea and conjunctival suffusion may be present. In the second phase, also known as the immune phase, the patient usually presents the triad: rubinic jaundice, acute renal failure, and hemorrhage configuring the classic Weil syndrome.<sup>5</sup> The circulation of immune complexes can cause meningism and circulatory collapse among other disorders. The duration and clinical manifestations of this phase are very variable.<sup>6</sup>

The professional scope is of great relevance to the epidemiology of the disease. Some professions present increasing risk of contamination as shown in Figure 1. In developing countries, like Brazil, its occurrence is related to worsen conditions of urban life in which the human infection occurs through contact with contaminated waters or soils, especially during periods of rains and floods.<sup>7</sup> This condition promotes the contamination of other groups by exposing individuals of various social and professional classes. There is no susceptibility in relation to gender when both are exposed to the sources of contagion, although it is prevalent in males.

In recent years, several outbreaks of the disease have been reported around the world, mainly in the Americas, with averages of 100 cases or more per 100 thousand inhabitants.<sup>4</sup> Despite the lack of accurate data, the WHO estimates average lethality at 10%.<sup>6</sup> According to the Ministry of Health, the main age group affected is from 15 to 59 years old and the main region

involved is the Southeastern (37.4%), followed by the Southern (31.7%), and Northeastern (19.1%). Out of all reported cases, 86% are in urban areas, while only 11% come from the countryside.<sup>2</sup>



**Figure 1** - Relationship between professional activities associated with leptospirosis in the city of Itaperuna. Source: Secretary of Epidemiologic Surveillance from the Secretary of Health 2009-2012 and Emílio Ribas Institute of Infectology (SAME 1980-1985).

The diagnosis must be based on clinical-laboratory and clinical-epidemiological aspects; all suspected cases must be reported to the Epidemiological Surveillance.<sup>7</sup> The diagnostic confirmation is made by direct search of microorganisms in the blood or urine (leptospiemia and leptospiuria), by serological tests and isolation of the microorganism in an inoculated animal, however, the PFGE method is the gold standard for the diagnosis of leptospirosis.<sup>8</sup> Treatment is based on antibiotic therapy, support measures and, where appropriate, hospitalization in the intensive care unit and ventilatory support.

This study aims to outline the epidemiological profiles of cases of leptospirosis in the city of Itaperuna, determining their spatial and temporal distribution, in order to provide a comprehensive and up-to-date database that can complement control projects aimed at preventing the perpetuation of this disease.

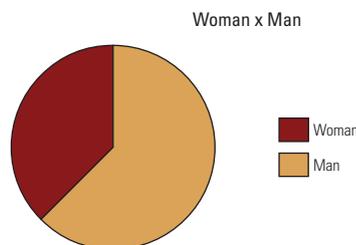
## PATIENTS AND METHODS

This study, based on the analysis of secondary data, was conducted in the city of Itaperuna, in the northwestern region of Rio de Janeiro, State of Rio de Janeiro, Brazil. Data were collected on the basis of

the analysis of a total of 70 medical records obtained in the Central Epidemiological Surveillance from the Secretary of Health, between November of 2009 and February of 2012, being the collection period from February to March in the same year. The cases selected for the study are those who presented fever, headache, and myalgia. A spreadsheet was developed to verify the characteristics of leptospirosis cases in the municipality with the following variables: gender, age, occupation, city, area (urban or rural), clinical and epidemiological criteria, polymerase chain reaction (PCR) and ELISA – used to ratify or refute the diagnosis –, risk situations occurred in the 30 days preceding the first manifestations, and their starting dates and evolution.

## RESULTS

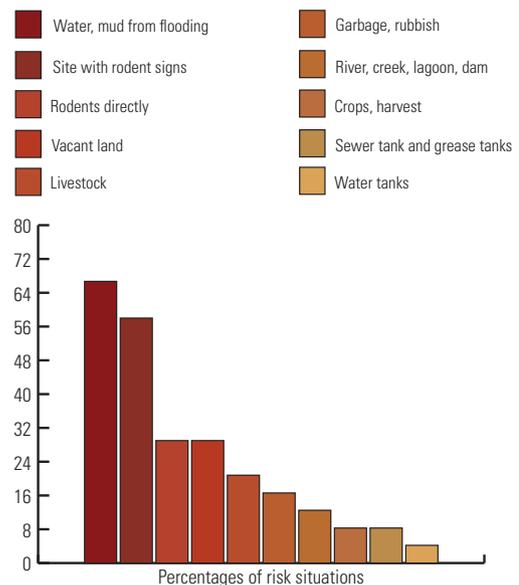
The analysis showed that, among the 70 cases presenting symptoms suspicious of leptospirosis, the number of confirmed events was 24, which equates to 34.28% of the total. A strong prevalence was observed in males compared to females in the proportion of 15:9. In relation to age, the median found was 38 years old and the average 40.8 years old, being 66 years the oldest age and 22 years the youngest. Of these cases, only four had a rural origin (16.6%). Considering professions, six were maids (25%), followed by construction workers (16.6%), farmers, traders, and students (8.3%), and other professions (33.5%).



**Figure 2** - Distribution of leptospirosis by gender. Source: Epidemiologic Surveillance from the Secretary of Health in Itaperuna – RJ, 2009-2012.

The analysis of the risk situations shows that those exposed to natural phenomena, water and mud from floods and places with signs of rodents as the most susceptible to infection, being present as 66.7% and 58%, respectively. The direct contact with rodents and wasteland was present in 29% of cases. The association with water tanks was found in only one case.

A cross-check of the signs and symptoms data showed fever, myalgia, and headache in all studied cases. Prostration was found in 91.7% and pain in the calf in 87.5% of patients. Vomiting was present in 66.7% and diarrhea in 50%. Other bleeding, meningism, and cardiac alterations were positive in only one case each (4.2%).



**Figure 3** - Risk factors and leptospirosis. Source: Epidemiologic Surveillance from the Secretary of Health in Itaperuna – RJ, 2009-2012.

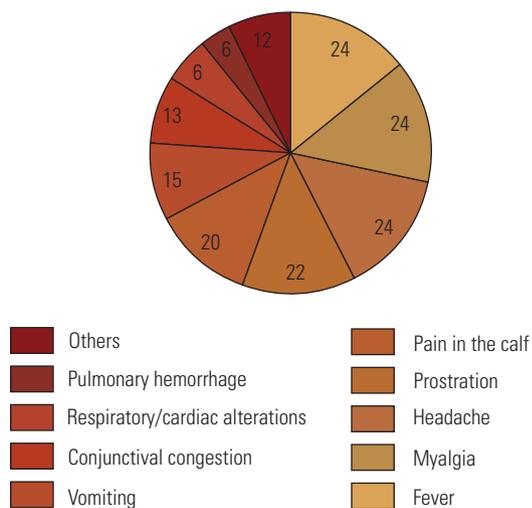
Most cases (87.5%) were distributed between November and April as follows: seven in November (29%), five in December (21%), four in January and four in April (16.6%), and only one case in February. During the other months of the year, only three cases (12.5%) were notified, one in May and two in August.

The disease evolution proved to be favorable in most cases; cure was achieved in 87.5% of patients. Among those who presented fatal evolution (12.5%), the main identified cause of death was massive pulmonary hemorrhage.

## DISCUSSION

The epidemiological profile of the population affected in Brazil consists of young adults, males, resident in urban areas, and contaminated from occupational exposure<sup>9</sup> According to the collected data, the incidence of leptospirosis in the male population showed strong prevalence, in the proportion of 15:9, which is in line with the literature data. The findings

confirm the theoretical basis regarding the prevalence of the disease in urban areas and with low socioeconomic development in relation to other areas reaffirming the importance of anthrozoosis as a public health problem susceptible to prevention and control.



**Figure 4** - Signs and symptoms at admission according to the number of patients. Source: Epidemiologic Surveillance from the Secretary of Health in Itaperuna – RJ.

In relation to age, young adults were the most affected group; however, a wide variation in age, from 22 to 66 years, was observed according to the literature. The professional profile data revealed the following as the main risk activities in descending order: maids, construction workers, followed by farmers, merchants, and students.

Construction workers are classically the most affected, in contrast to this study, which identified the main affected as maids (25%). This fact reflects the close relationship between exposure and contamination of this professional class resulting from greater contact with contaminated waste and frequent unprotected execution of household chores. Conversely, construction workers occupy second place and farmers, merchants, and students were less affected.

Another important aspect that should not be neglected, given its epidemiological importance, is the exposure to key risk factors. In Itaperuna, contact with water and mud from floods were the main risk factors associated with the disease, reaffirming concepts found in the literature.

The signs and symptoms on admission showed low specificity similar to that reported by previous studies and reiterated the delay in the correct disease diagnosis. The main complaints presented to the health service by pa-

tients were fever, myalgia, and headache; this syndromic triad was present in all those subsequently confirmed for the infection in question by serological methods.

In accordance with global accounts, the evolution to cure was the most common event; the death rate found in our study was 2.5% and greater than those reported previously. The main cause of death, as expected, was pulmonary hemorrhage.

The municipality of Itaperuna, Rio de Janeiro State, has a striking feature of seasonal rain regime. Annually, heavy rains ravage the region from December to January culminating with the flood of the Muriaé River, which runs through the city, facilitating the occurrence of floods, although the highest number of cases has been found in November.

According to the collected data, the frequency of leptospirosis in Itaperuna has a sharp variation according to the rainfall. The epidemiological data, in conjunction with the clinical and laboratory data were consistent with the criteria of probability for diagnosis of leptospirosis and corroborate preliminary observations.

## CONCLUSION

According to the exposed, the profile of inhabitants most susceptible to infection by *Leptospira* sp can be acquired and use to tailor health strategies to prevent the emergence of the disease and perform faster diagnoses and earlier interventions using these results. The importance of primary prevention in the management of leptospirosis should be prioritized as a way to prevent new cases. Effective steps could represent: garbage collection, packaging, and destination; maintenance of vacant land; adequate cleansing and disinfection of water reservoirs; construction and permanent maintenance of rainwater galleries, sewers in urban areas, in addition to reducing the risk of exposure to mud floods.<sup>9</sup>

On these findings, we reaffirm the importance of this anthrozoosis, which is preventable, and reaches the socially less favored communities.

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