

## Epidemiological Report

# Leptospirosis

Historic Series 2010 – 2021

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## INTRODUCTION

The floods that hit the state of São Paulo, Brazil, every year bring risks to the health of the population, especially leptospirosis, a febrile infectious disease of sudden onset, whose clinical spectrum can vary from an inapparent or oligosymptomatic process to severe forms associated with fulminant manifestations. Its frequency is related to the precarious conditions of sanitary infrastructure and the high infestation of infected rodents.

Leptospirosis can occur throughout the year; however, it has a higher incidence in the summer months because of the rains and floods that occur at that time. Consequently, they provide a greater chance of collective human contact with rodent urine.

## ETIOLOGIC AGENT

The etiologic agent is the obligate aerobic helical bacterium (spirochete) of the genus *Leptospira*, of which 14 pathogenic species are known, and the most important is *L. interrogans*. The basic taxonomic unit is the serovar (serotype).

There are more than 250 identified serovars, each with its preferred host(s), although an animal species may harbor one or more. In Brazil, the serovars *Icterohaemorrhagiae* and *Copenhageni* are related to the most severe cases of the disease.

## MODE OF TRANSMISSION

A broad spectrum of domestic and wild synanthropic animals serves as a reservoir for persistent foci of leptospirosis infection. In urban areas, the main rodents are *Rattus norvegicus* (common rat or sewer rat), *Rattus rattus* (roof rat or black rat), and *Mus musculus* (house mouse). These animals, which do not develop the disease when infected, harbor leptospira in their kidneys, and eliminate it alive in the environment and contaminate water, soil, and food. Other reservoirs of leptospirosis include dogs, pigs, cattle, horses, sheep, and goats.

Human infection results from direct or indirect exposure to the urine of infected animals. The penetration of the microorganism occurs through skin lesions, intact skin immersed for long periods in contaminated water, or through mucous membranes. Other modes of transmission, although infrequent, are contact with infected blood, tissues, and organs; accidental contagion in laboratories; and ingestion of contaminated water or food. Interhuman transmission is very rare and of little epidemiological relevance. Humans are just accidental and terminal hosts in the chain of transmission.

## EPIDEMIOLOGICAL SITUATION

In this report, a descriptive analysis was carried out on the information from the epidemiological investigation forms of confirmed cases of leptospirosis of people residing in the state of São Paulo (ESP), from the database of the Notifiable Diseases Information System (SINAN), of those who had the onset of symptoms between January 01, 2010, and December 31, 2021.

During this period, the disease occurred in all regions of São Paulo, and the highest incidences were recorded in Registro, Santos, Mogi das Cruzes, Assis, Campinas, São José dos Campos, Osasco, capital, Caraguatatuba, and Taubaté, as shown in Table 1. Santos, Presidente Venceslau, Itapeva, Bauru, Santo André, the capital, Sorocaba, Osasco, Registro, Mogi das Cruzes, and Franca draw attention because of the higher fatalities than the state average.

**Table 1.** Confirmed cases, average incidence rate, deaths, and lethality of leptospirosis according to epidemiological surveillance group (GVE) of residence, ESP, Brazil – 2010 to 2021.\*

| GVE of residence             | Confirmed cases | Average incidence rate | Deaths | Lethality |
|------------------------------|-----------------|------------------------|--------|-----------|
| GVE 1 CAPITAL                | 2,186           | 1.55                   | 299    | 13.68     |
| GVE 7 SANTO ANDRÉ            | 391             | 1.22                   | 56     | 14.32     |
| GVE 8 MOGI DAS CRUZES        | 939             | 2.73                   | 123    | 13.10     |
| GVE 9 FRANCO DA ROCHA        | 87              | 1.28                   | 10     | 11.49     |
| GVE 10 OSASCO                | 600             | 1.73                   | 80     | 13.33     |
| GVE 11 ARAÇATUBA             | 6               | 0.07                   | 0      | 0.00      |
| GVE 12 ARARAQUARA            | 33              | 0.28                   | 2      | 6.06      |
| GVE 13 ASSIS                 | 108             | 1.90                   | 9      | 8.33      |
| GVE 14 BARRETOS              | 14              | 0.27                   | 1      | 7.14      |
| GVE 15 BAURU                 | 63              | 0.47                   | 12     | 19.05     |
| GVE 16 BOTUCATU              | 53              | 0.75                   | 3      | 5.66      |
| GVE 17 CAMPINAS              | 970             | 1.85                   | 77     | 7.94      |
| GVE 18 FRANCA                | 23              | 0.28                   | 3      | 13.04     |
| GVE 19 MARÍLIA               | 68              | 0.89                   | 4      | 5.88      |
| GVE 20 PIRACICABA            | 241             | 1.33                   | 17     | 7.05      |
| GVE 21 PRESIDENTE PRUDENTE   | 20              | 0.36                   | 2      | 10.00     |
| GVE 22 PRESIDENTE VENCESLAU  | 5               | 0.14                   | 1      | 20.00     |
| GVE 23 REGISTRO              | 145             | 4.33                   | 19     | 13.10     |
| GVE 24 RIBEIRÃO PRETO        | 68              | 0.40                   | 8      | 11.76     |
| GVE 25 SANTOS                | 684             | 3.22                   | 153    | 22.37     |
| GVE 26 SÃO JOÃO DA BOA VISTA | 65              | 0.67                   | 4      | 6.15      |
| GVE 27 SÃO JOSÉ DOS CAMPOS   | 214             | 1.71                   | 25     | 11.68     |
| GVE 28 CARAGUATATUBA         | 56              | 1.50                   | 3      | 5.36      |
| GVE 29 SÃO JOSÉ DO RIO PRETO | 179             | 1.15                   | 17     | 9.50      |
| GVE 30 JALES                 | 21              | 0.67                   | 2      | 9.52      |

| GVE of residence | Confirmed cases | Average incidence rate | Deaths       | Lethality    |
|------------------|-----------------|------------------------|--------------|--------------|
| GVE 31 SOROCABA  | 371             | 1.46                   | 50           | 13.48        |
| GVE 32 ITAPEVA   | 41              | 1.23                   | 8            | 19.51        |
| GVE 33 TAUBATÉ   | 192             | 1.50                   | 23           | 11.98        |
| <b>TOTAL</b>     | <b>7,843</b>    | <b>1.49</b>            | <b>1,009</b> | <b>12.86</b> |

Source: Division of Zoonoses/CVE/CCD/SES-SP. \*Data extracted on June 6, 2022.

In ESP, from 2010 to 2021, the highest incidence was recorded in 2011 (2.36/100,000 inhabitants) and the lowest in 2021 (0.64/100,000 inhabitants). The second lowest incidence occurred in 2020 (0.72). As for the case fatality rate, the lowest was in 2012 (9.90%) and the highest was in 2020 (16.72%) (Table 2).

**Table 2.** Frequency of cases and deaths, coefficient of incidence, and lethality of leptospirosis by year of symptom onset, ESP, Brazil, 2010 to 2021.\*

| Year of symptom onset | Frequency of cases | Coefficient of incidence | Frequency of deaths | Lethality    |
|-----------------------|--------------------|--------------------------|---------------------|--------------|
| 2010                  | 892                | 2.16                     | 106                 | 11.88        |
| 2011                  | 981                | 2.36                     | 116                 | 11.82        |
| 2012                  | 778                | 1.86                     | 77                  | 9.90         |
| 2013                  | 949                | 2.17                     | 112                 | 11.80        |
| 2014                  | 751                | 1.71                     | 94                  | 12.52        |
| 2015                  | 628                | 1.41                     | 91                  | 14.49        |
| 2016                  | 594                | 1.33                     | 71                  | 11.95        |
| 2017                  | 537                | 1.19                     | 80                  | 14.90        |
| 2018                  | 523                | 1.16                     | 84                  | 16.06        |
| 2019                  | 578                | 1.26                     | 80                  | 13.84        |
| 2020                  | 335                | 0.72                     | 56                  | 16.72        |
| 2021                  | 297                | 0.64                     | 42                  | 14.14        |
| <b>Total</b>          | <b>7,843</b>       |                          | <b>1,009</b>        | <b>12.86</b> |

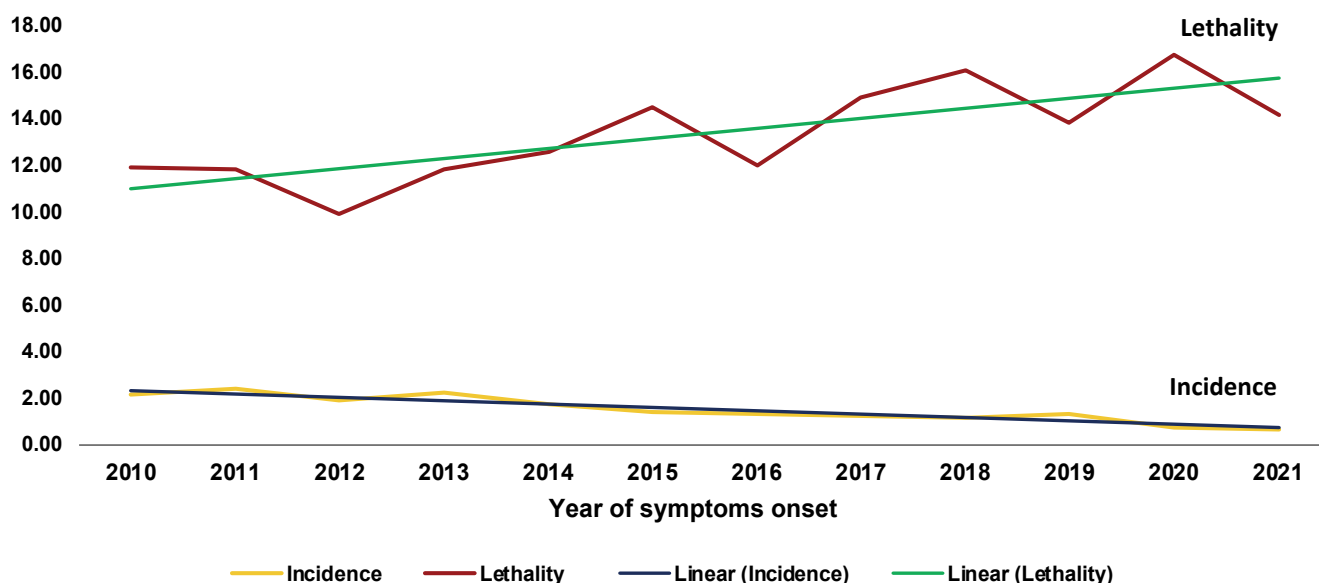
Source: Division of Zoonoses/CVE/CCD/SES-SP. \*Data extracted on June 6, 2022.

It is worth mentioning that, regarding 2020, the year in which the covid-19 pandemic began, and 2021, when there was an overload of the health services aimed at this disease, the compulsory notification of many diseases had a significant decrease. This fact is likely to have occurred for leptospirosis, mainly in relation to mild and moderate cases, because of the lack of demand for services by the population, who feared being infected by the coronavirus in these places. In addition, these clinical conditions may have been confused with the pandemic disease.

There was probably a greater notification of severe cases of leptospirosis because of its more characteristic clinical condition, thus contributing to increasing the overload of intensive care units in hospitals, which were already at full capacity from the Covid-19 crisis. This also hindered the performance of dialysis processes in a timely manner (important procedures in cases of leptospirosis with acute renal failure). Under this scenario, lethality in 2020 was the highest in the period studied.

It is interesting to observe the decreasing trends in the coefficient of incidence and the increasing lethality from 2010 to 2021 (Chart 1). It is worth mentioning that the trends remain the same even when the atypical years of 2020 and 2021 are subtracted from this analysis.

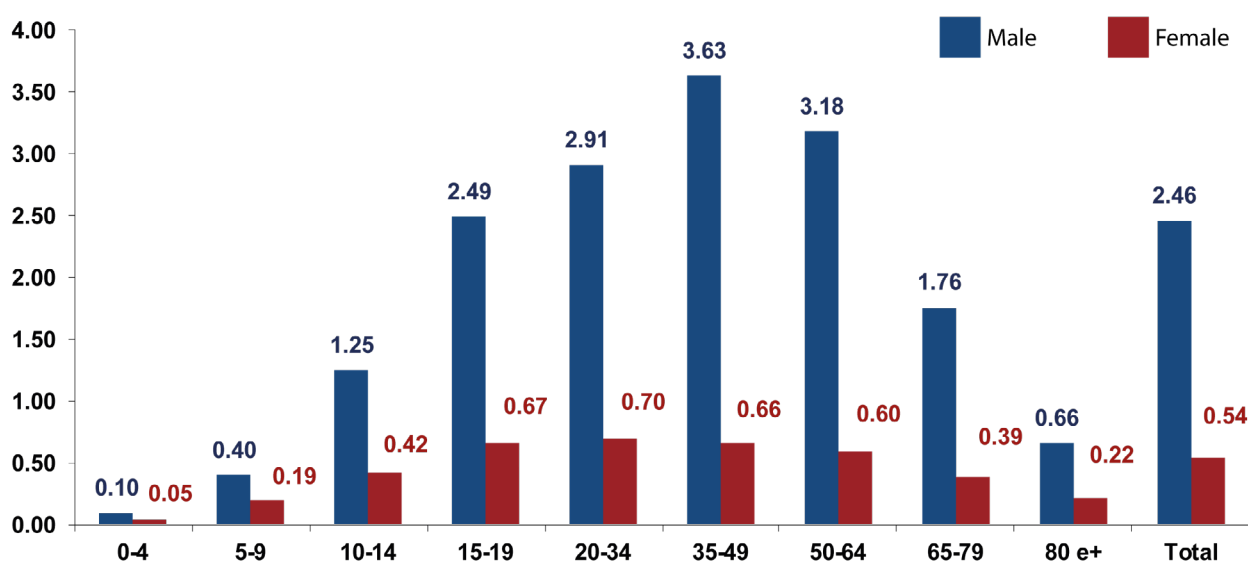
**Chart 1.** Leptospirosis incidence, lethality, and trend lines of incidence and lethality, ESP, Brazil, 2010 to 2021.\*



Source: Division of Zoonoses/CVE/CCD/SES-SP. \*Data extracted on June 6, 2022.

In the period studied, 81% of the cases occurred in males – a total of 6,372 males for 1,471 females. Measured by the average incidence rate, the age groups at greatest risk in men were 35 to 49 years and 50 to 64 years; among women, they were 20 to 34 years and 35 to 49 years ([Chart 2](#)).

**Chart 2.** Average incidence rate of leptospirosis by sex and age group, ESP, Brazil, 2010 to 2021.



Source: Division of Zoonoses/CVE/CCD/SES-SP. \*Data extracted on June 6, 2022.

As for the variable “Occupation” of the epidemiological form, students, construction workers, those unemployed, housewives, retirees, waste pickers, truck drivers, and agricultural workers, among other professions, stand out. However, it is important to note that in approximately 50% of the cases this information was not filled in (Table 3).

**Table 3.** Confirmed cases of leptospirosis by occupation, ESP, Brazil, 2010 to 2021.\*

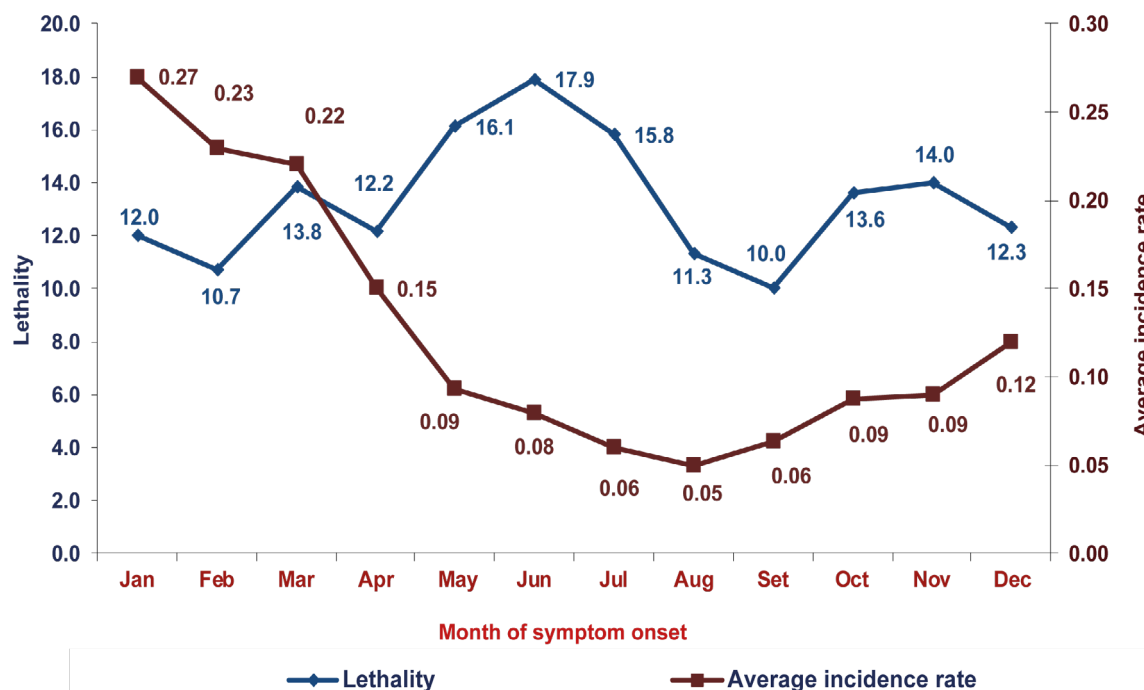
| Occupation  | Total | Percentage |
|---|-------|------------|
| Blank   | 3,964 | 50.3       |
| Student   | 490   | 6.2        |
| Ignored   | 419   | 5.3        |
| Construction worker   | 348   | 4.4        |
| Chronic unemployed person or whose usual occupation could not be obtained | 346   | 4.4        |
| Housewife   | 228   | 2.9        |
| Retiree/pensioner   | 221   | 2.8        |
| Waste picker  | 154   | 2.0        |
| Truck driver (regional and international routes)                          | 64    | 0.8        |
| General agricultural worker   | 56    | 0.7        |
| Retail trade salesperson  | 40    | 0.5        |
| Garbage collector   | 39    | 0.5        |
| Gardener  | 38    | 0.5        |
| Painter   | 38    | 0.5        |

| Occupation  | Total | Percentage |
|---|-------|------------|
| Retailer  | 36    | 0.5        |
| Laborer   | 36    | 0.5        |
| Passenger car driver  | 36    | 0.5        |
| Independent sales representative  | 35    | 0.4        |
| Janitor   | 35    | 0.4        |
| Maintenance mechanic for automobiles, motorcycles, and similar vehicles | 33    | 0.4        |
| Housekeeper   | 27    | 0.3        |
| Plumber   | 25    | 0.3        |

Source: Division of Zoonoses/CVE/CCD/SES-SP. \*Data extracted on June 6, 2022.

The disease showed a clear seasonality throughout the record with a greater number of cases in the hot months (November to April), when heavy rains with floods occur, although there is incidence throughout the year. In this regard, attention is drawn to the higher lethality in the cold months, probably explained by the fact that health services do not think about leptospirosis when there is no flooding and do not consider the precarious housing conditions and the risks of disease to which the patients are exposed throughout the year. Thus, diagnosis and appropriate treatment are delayed (Chart 3).

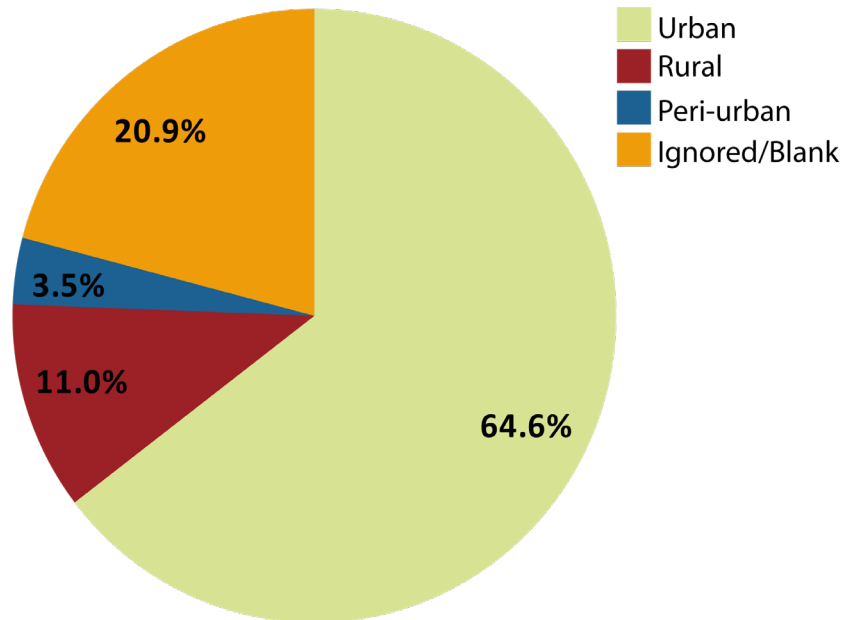
**Chart 3.** Average incidence rate and lethality of leptospirosis by month of symptom onset, ESP, Brazil, 2010 to 2021.\*



Source: Division of Zoonoses/CVE/CCD/SES-SP. \*Data extracted on June 6, 2022.

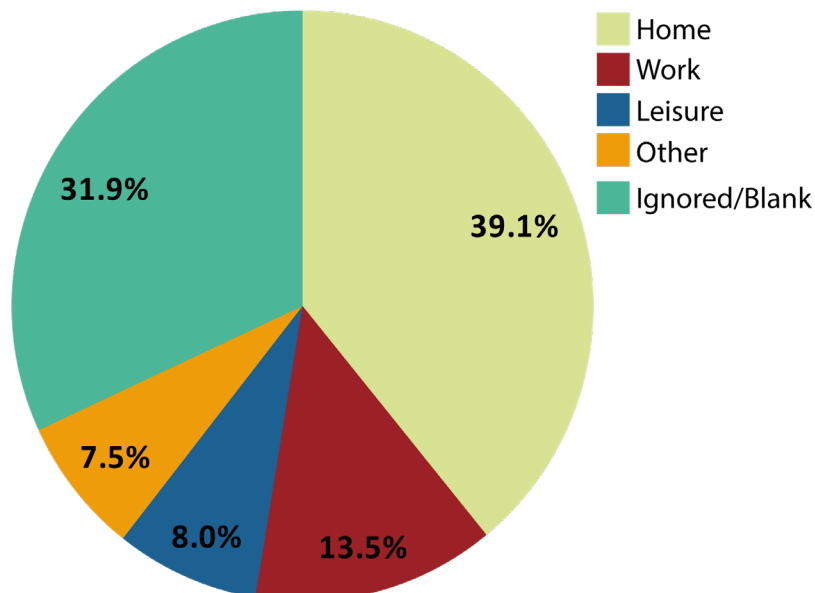
Regarding the probable site of infection, 64.6% of the cases acquired the disease in urban areas (Chart 4). As for the environment, 39.1% contracted it at home (Chart 5).

**Chart 4.** Percentage of confirmed leptospirosis cases by area of probable site of infection, ESP, Brazil, 2010 to 2021.\*



Source: Division of Zoonoses/CVE/CCD/SES-SP. \*Data extracted on June 6, 2022.

**Chart 5.** Percentage of confirmed leptospirosis cases by environment of probable site of infection, ESP, Brazil 2010 to 2021.\*

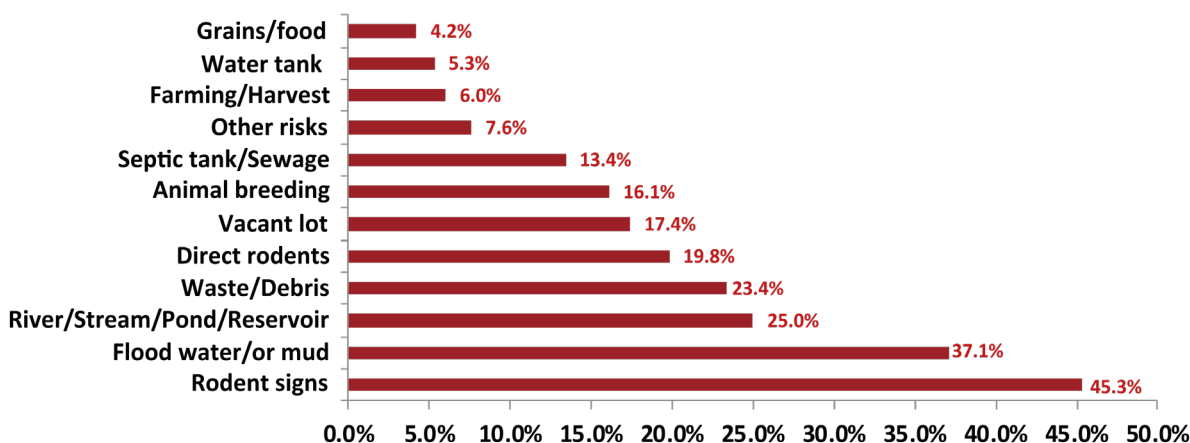


Source: Division of Zoonoses/CVE/CCD/SES-SP. \*Data extracted on June 6, 2022.



Regarding the most frequent risk situation that occurred in the 30 days before the first symptoms, 45.3% of the cases visited a place with signs of rodents, 37.1% had contact with flood water or mud, 25.0% had contact with water river or other bodies of water, 23.4% had contact with garbage or debris, 19.8% had direct contact with rodent urine, and 17.4% had contact with a vacant lot. It should be noted that more than one risk is incorrectly marked for each case (Chart 6).

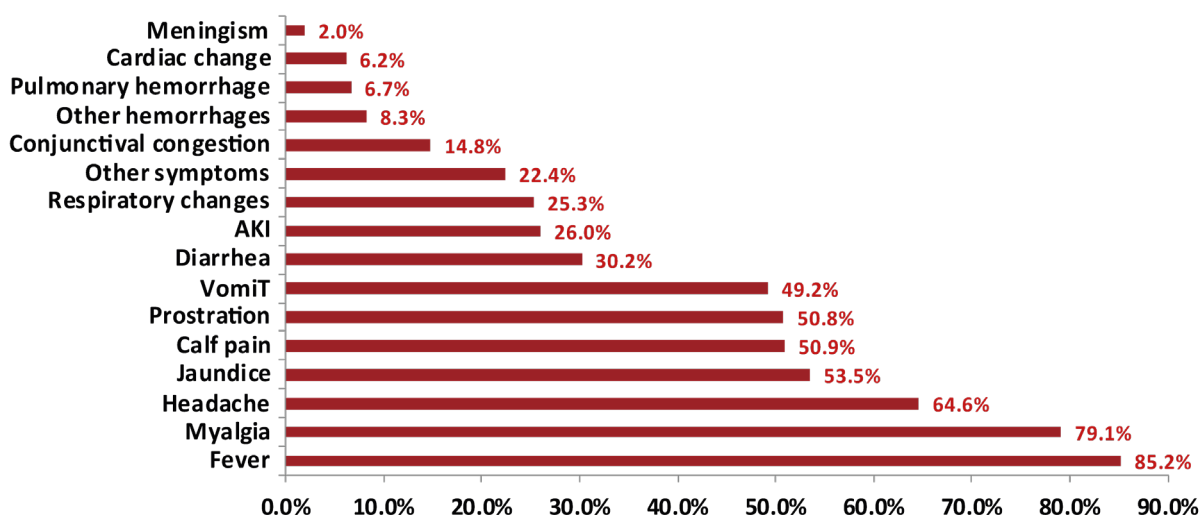
**Chart 6.** Percentage of confirmed leptospirosis cases by risk situation occurring in the 30 days before symptoms, ESP, Brazil, 2010 to 2021\*



Source: Division of Zoonoses/CVE/CCD/SES-SP. \*Data extracted on June 6, 2022.

Regarding the symptoms that indicate the severity, 53.5% of the cases presented jaundice, 25.3% respiratory changes, 26.0% acute renal failure, 6.2% cardiac changes, and 15.0% had hemorrhagic conditions (Chart 7).

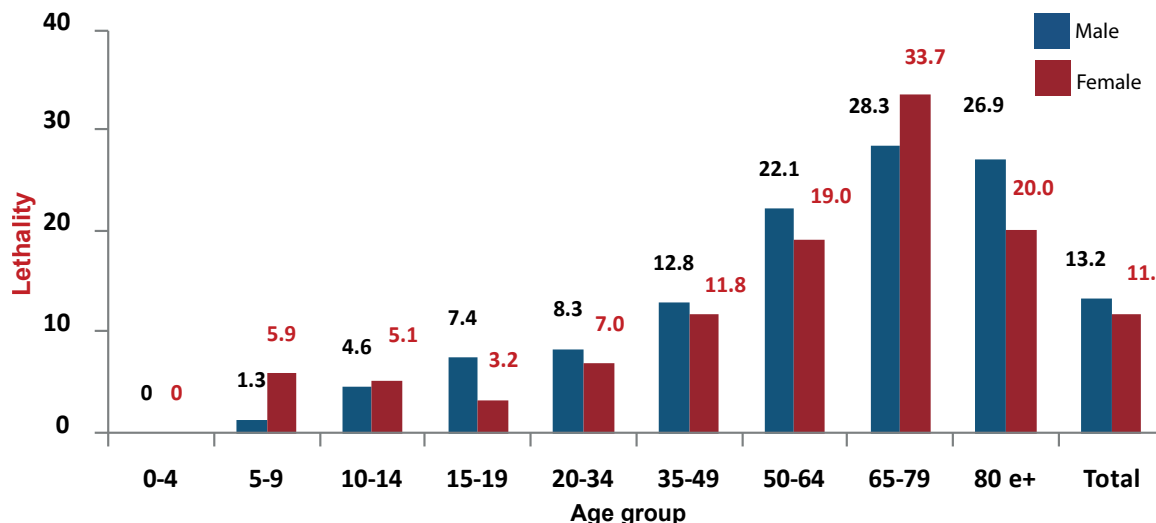
**Chart 7.** Percentage of confirmed leptospirosis cases by symptoms, ESP, Brazil, 2010 to 2021.\*



Source: Division of Zoonoses/CVE/CCD/SES-SP. \*Data extracted on June 6, 2022.

Regarding lethality, the disease was slightly higher in men, 13.2% (837 deaths), than in women, 11.7% (172 deaths). The age group with the highest rate in both sexes was 65 to 79 years, and women showed a higher rate than men (Chart 8). It is worth mentioning that men had higher lethality in five age groups compared to three age groups for women.

Chart 8. Lethality in percentage of confirmed leptospirosis cases by sex and age group, ESP, Brazil, 2010 to 2021.\*



Source: Division of Zoonoses/CVE/CCD/SES-SP. \*Data extracted on June 6, 2022.

In conclusion, during the period studied, leptospirosis affected all regions of the 28 GVE of the State of São Paulo. The disease showed clear seasonality, but it occurred throughout the year, including with higher lethality in the cold months. It affected more men, and adults and young adults of both sexes were the age groups with the highest incidence.

The high percentage (greater than 10%) of cases with jaundice draws the attention, which could mean that the health services were more prepared to diagnose severe forms, with characteristic clinical conditions, and paid little attention to the suspicion of mild and moderate forms without jaundice, which represent nonspecific clinical conditions. This fact could also explain the fatalities above 10%, considered high in this period, thus determining the need for constant refresher training aimed at early and adequate diagnosis and treatment of the disease.

As for the risk, leptospirosis in the territory of São Paulo was predominantly urban and acquired mainly at home, in situations where people encountered the urine of urban rodents. This determines that its prevention, in health, must be based on educational actions aimed at people and control of the murine population.

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