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Clinical epidemiological characterization of leptospirosis during the period 2001-2022 in the Santa Clara municipality, Cuba

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Abstract

The objective of the study was to characterize clinically and epidemiologically human leptospirosis in the Santa Clara municipality, between 2001 and 2022. An observational, descriptive and cross-sectional study was carried out. In the affected human population, the incidence, trend, seasonality and endemic channel were determined in a 21-year time series. The occurrence of outbreaks by year, morbidity, lethality, mortality, cases by area, seasonality, were found. The incidence of human leptospirosis in the municipality of Santa Clara is high, and the most affected were the "Captain Roberto Fleites" and "Marta Abreu" health areas. The age group with the highest number of cases was emphasized in patients with age comprehend between 15 and 59 years old, with a predominance of males. Human leptospirosis manifests a seasonal behavior with a tendency to persist. The most frequent symptoms in affected humans were headache, pyrexia, myalgia and jaundice and afebrile cases in pediatric age are described as contributions to the epidemiology in the territory.

Keywords: Incidence; Mortality; Symptoms; Weil disease

1 Introduction

Leptospirosis is a re-emerging infectious disease (García *et al*., 2013; Carreño *et al*., 2017; Zakharova *et al*., 2021). The etiological agent of the disease is *Leptospira* spp., a Gram-negative spirochete of which at least 22 species and more than 300 serovars have been reported (Dhewantara *et al*., 2020).

In Cuba, human leptospirosis has changing epidemiological characteristics and is classified among the 35 leading causes of death; The main reservoirs are: rats, pigs, dogs and cattle (Suarez *et al*., 1999; Ortiz *et al*., 2019; Obregón, 2023). It is a disease that has an endemo-epidemic behavior with a seasonal cyclical character. In 1994, a national incidence rate of 25.6/100,000 inhabitants was reported, a figure that constitutes the highest historical epidemic record after the revolutionary period (Suarez *et al*., 1999; Obregón *et al*., 2018).

In the province of Villa Clara, several studies have been carried out that have addressed epidemiological aspects of human and animal leptospirosis (Castillo *et al*., 2016; Lazo *et al*., 2017; Pérez *et al*., 2017; Ortiz *et al*., 2018). However,

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in the Santa Clara municipality there are no comprehensive clinical-epidemiological studies under the one health approach, which cover time series of many years (Castillo *et al*., 2016; Ortiz *et al*., 2019).

It is necessary to carry out research, especially in those factors in which there are contradictory results or have not been studied, which allow a more complete knowledge of the epidemiology of the disease in this territory and draw up strategies for prevention and control (Castillo *et al*., 2016; Ortiz *et al*., 2019; Obregón, 2023).

Therefore, the objective of this study was to clinically and epidemiologically characterize human leptospirosis in the Santa Clara municipality, between 2001 and 2022.

2 Material and methods

2.1 Study area

The research was carried out in the municipality of Santa Clara, located in the south-central portion of the province of Villa Clara, Cuba, at 22.40615º north latitude and 79.96566º west longitude. In the city of Santa Clara there is a population of 244,661 inhabitants, around 96,574 homes and/or premises in the general universe, of which, 85,263 belong to the urban universe (88.28%), according to data from the Provincial Unit Surveillance and Anti-Vector Fight (UPVLA).

2.2 Epidemiological analysis

An epidemiological, observational, descriptive, retrospective, cross-sectional study was carried out in a time series in the period from 2001 to 2022. The monthly and annual occurrence of leptospirosis cases, the number of cases according to groups, were determined. of ages, sex, race, occupation, sources of infection and/or routes of transmission, housing status and rural or urban area. As well as a distribution by health areas.

Seasonality and trend were determined and the incidence, mortality and fatality rate were calculated. The endemic channel for the occurrence of leptospirosis cases in the territory was established and the occurrence of the year 2023 was superimposed on the historical behavior of the time series. The affected population was analyzed according to occupation and a frequency distribution of the symptoms in the affected people was made.

The sources of information were the time series obtained from the database of the Department of Hygiene and Epidemiology. The information was collected from the documentary review of all the epidemiological surveys that were applied to patients who were notified as confirmed leptospirosis. The survey was validated by experts at the national level and is applied as part of the National Leptospirosis Control Program in the country by the Ministry of Public Health (MINSAP) of Cuba. To corroborate the clinical diagnosis, the serological technique of Passive Hemagglutination (HA) was used (Obregón *et al*., 2001), which is applied to patients with clinical-epidemiological symptoms of leptospirosis in Cuba.

2.3 Statistical analysis of the results

A database was created using the Microsoft Excel tabulator and the results obtained were processed using the Statgraphics Centurion view statistical package. XV.II. (Statistical Graphic Corp., USA 2006). To compare the incidence of leptospirosis cases by age groups and sex, a binomial proportion comparison test was performed. Descriptive statistics were applied to determine the frequency distribution of the occurrence of leptospirosis by age and sex groups, as well as the absolute and relative frequency of the symptoms found in the affected population.

To determine the presence of the seasonal component, the occurrence of leptospirosis was analyzed with the values obtained from 252 time periods; their seasonal decomposition was carried out by the additive method. The monthly occurrence was separated into the Cycle-Trend, seasonal and random components, the seasonal indices were obtained for each month, scaled so that an average station was equal to 100, their graphs and the annual trends. The trend component of the occurrence of cases was analyzed using the equation of the trend line adjusted by the least square method.

To establish the usual behavioral channels of the occurrence of cases throughout the analyzed period, the average, first and third quartile method was used, which is based on determining for each period (months) a measure of central tendency and its values. minimums and maximums, in order to define security or alert zones.

The average, minimum and maximum value of the occurrence of cases in each month of the 21-year period of the time series analyzed was found, and the channels were constructed with the central measurement, the lower range and the upper range, establishing the success zones (values equal to or lower than the lower limit), safety zone (values equal to or lower than the average and higher than the lower limit), alert zone (values equal to or higher than the average and lower than the upper limit) and epidemic zone (values equal to or greater than the upper limit). The occurrence of monthly cases during the year 2023 was determined and superimposed on the historical behavior of the usual behavior channels found for the period 2001 – 2021. The trend was found using the least square method.

3 Results and discussion

Figure 1 shows the annual occurrence of cases of human leptospirosis in the Santa Clara municipality during the analyzed period.

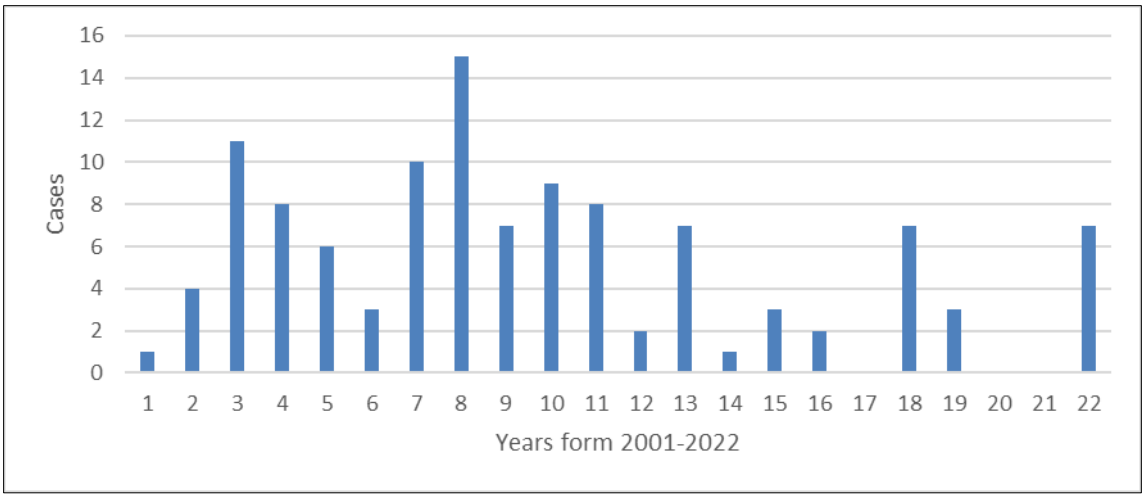


Figure 1 Distribution of human leptospirosis cases in the Santa Clara municipality in the period 2001-2022

Substantial variability can be noted in the annual manifestation of leptospirosis, characterized by an irregular pattern. Four significant peaks stand out notably in the years 2003, 2007, 2008 and 2010, in particular, the year 2008, which recorded the peak of cases with a total of 15.

It is pertinent to emphasize that the largest outbreaks were closely linked to climatic conditions of intense rainfall, as well as the occurrence of hurricanes. The essential relationship lies in the fact that copious rains stimulate rodents to come to the surface in search of sustenance, which leads to contamination of the water by urine from these reservoirs and creates an environment conducive to the survival of *Leptospira* in the aquatic environment. Furthermore, it is important to note that other animals, by carrying the bacteria, contribute to the contamination of water and food, since they excrete it into the environment (Levett *et al*., 1998; Martín *et al*., 2002; Patiño *et al*., 2010).

These results agree with those obtained by Abreu (2022), in a study carried out in Cuba where the increasing rates of leptospirosis in these years were linked to the merciless attacks of the hurricanes that devastated the region in that period. Emphasizing that tropical storms and intense rains caused significant rainfall and flooding, which favored the occurrence of epidemic outbreaks. Furthermore, they coincide with the results reported by other researchers, where they point out that the incidence of the disease is higher in the rainy season (Tabo *et al*., 2018; Colina and Rodríguez, 2023).

In the years in which the occurrence of leptospirosis cases is not recorded, this is due to an underreporting of the incidence of the disease in the territory, which underestimates the real number of cases. Leptospirosis often goes unnoticed, is not considered a probable diagnosis and, consequently, is not given proper medical attention (García *et al*., 2013; Zakharova *et al*., 2021; Obregón, 2023). Furthermore, due to the coincidence with the COVID-19 pandemic in full swing, immersed in a critical scenario in the years 2020 and 2021, which generated a state of health emergency at a global level and diverted attention to the diagnosis of this disease. This reasoning coincides with the elements that were founded by Sosa and Zaldivar (2022) in a study on alveolar hemorrhage due to leptospirosis in times of COVID-19 in Colombia.

On the other hand, sometimes patients with fever syndrome are treated with antibiotics without undergoing a specific diagnosis of leptospirosis. This therapeutic approach may relieve symptoms, but it does not solve the underlying problem. As a result, the lack of identification of the disease is perpetuated, leading to underreporting and underestimation of the true incidence of leptospirosis (Tabo *et al*., 2018; Abreu, 2022; Obregón, 2023).

Table 1 shows the absolute and relative frequency distribution of the number of cases of human leptospirosis by age groups and sexes in the period analyzed.

Table 1 Cases of human leptospirosis according to age groups and sexes in the Santa Clara municipality in the period 2001-2022

	0-14 years	**15-59 years**	**>60 years**	**Total (%) IR: 95%**
Male	18	51	15	84 (74.33) 66.28-82.38
Female	2	21	6	29 (25.66) 17.61-33.71
Total (%)	20 (17.69)	72 (63.71)	21 (18.58)	113 (100)

It is evident that the occurrence of leptospirosis is greater in men and in those between 15 and 59 years of age. Results that are attributed to the greater occupational risk of men compared to women, because men more frequently carry out or practice professional occupations such as veterinarians, livestock keepers, community workers, soldiers, slaughterers, agricultural workers, etc. and therefore are more exposed to contracting the infection.

This result agrees with what was reported in the Cuban Health Statistical Yearbook (Sosa and Saldivar, 2022), and with a study carried out by Diaz *et al*. (2018), where a greater number of men affected by the disease is highlighted as there is a relationship epidemiological conditioned by occupational exposure, among them farmers (in whom the risk is conditioned by several factors that result only in non-compliance with personal protection standards), sewage workers, livestock farmers, veterinarians, among others (Carreño *et al*., 2017; Muñoz, 2023).

It is also in agreement with Pérez *et al*. (2017) who, in a study carried out in the same territory, observed a marked preponderance in the group of individuals whose ages ranged between 15 and 59 years, reaching a significant percentage of 63.74%. This finding points to the close relationship between this age range and the highest risk activities associated with acquiring the disease (Chavarría *et al*., 2015; Serrano, 2023).

These results do not coincide with Zambrano *et al*. (2017) and Zambrano *et al*. (2021) who observed that leptospirosis predominated in the female sex. Results attributed to the fact that in the rural environment of Ecuador where the research was carried out, women are the ones who mostly feed and care for the farm animals, including pigs, cattle and dogs; activities carried out with inadequate footwear and without means of protection throughout the year, which is why they are in contact with water contaminated with urine, feces or remains of abortions; that constitute sources of infection of *Leptospira* spp.

There was a higher incidence of leptospirosis in individuals with white skin color (93), in non-white people (eight) and in mixed race (two). However, this result has no relationship with a greater susceptibility to the disease in people of White race. And it may be related to the predominant ethnicities in the municipality studied.

Table 2 shows the absolute frequency distribution in the number of cases of human leptospirosis according to the sources of infection and/or transmission routes in the period analyzed.

The presence of rodents in the home played a fundamental role as a primary source of infection, and bathing and fishing in rivers and contact with irrigation water and soil during agricultural work were the routes of transmission (Castillo *et al*., 2016; Ortiz *et al*., 2019; Zambrano *et al*., 2021).

This result coincides with Martín *et al*. (2002) and Castillo *et al*. (2016) in a clinical epidemiological study, where the majority of patients reported having had contact with rodents and/or living with them and where the main sources of infection for humans were rats, wild rodents, dogs, pigs and cattle. These animals excrete *Leptospira* through urine and feces, both during active disease and during the asymptomatic carrier period. Furthermore, Levett *et al*. (1998) state that the disease has a high prevalence where there is a high rate of peri-domiciliary rodents.

Table 2 Cases of human leptospirosis according to sources of infection and/or transmission routes in the Santa Clara municipality in the period 2001-2022

Source of infection and/or routes of transmission	Cases
Bathing in rivers	2
Bathing and fishing in rivers	31
Contact with animals	10
Contact with stagnant water during rice harvesting	2
Contact with irrigation water and soils during agricultural work	16
Not specified	7
Presence of rodents in the home	38
Contaminated water	2
Contaminated soil	5
Total	113

During the period under scrutiny, various categories of housing conditions were observed among patients affected with leptospirosis. There were 76 cases (67.25%) in patients with housing conditions considered good, 28 (24.77%) with fair housing conditions and 9 (7.9%) with poor housing conditions.

It is imperative to understand that susceptibility to leptospirosis is not limited to excellent or poor housing conditions. Rather, this vulnerability is intrinsically related to the individual practices and activities that a person carries out, which may expose them to potential risk of infection at specific times. On the contrary, someone can reside in an environment with regular or even poor housing conditions, and still not be exposed to a high presence of leptospirosis in their environment, especially if risky activities are not carried out. The acquisition of leptospirosis is associated with secondary factors and exposure to risky circumstances in the environment in which one operates (Obregón *et al*., 2001; Castillo *et al*., 2016; Zambrano *et al*., 2021).

This study does not coincide with the results of Martín *et al*. (2002), who stated that those individuals who lived in homes with a precarious structure showed a greater susceptibility to contracting diseases. According to the results obtained in these studies, it is not the poor housing conditions that affect the presentation of the disease, but rather the occupational exposure to the different sources of infection.

When analyzing the number of cases of human leptospirosis according to area of residence, it was found that 23 (20.35%) resided in rural areas and 90 (79.64%) resided in urban areas. These results are attributed to the fact that in Santa Clara there is a significant movement of the population from rural areas to urban areas (Castillo *et al*., 2016; Hernández *et al*., 2017; Lazo *et al*., 2017). This phenomenon has led to a concomitant decline in agricultural activities in the region (Zambrano *et al*., 2017; Obregón *et al*., 2018; Serrano, 2023).

It is relevant to highlight that this transition has influenced the prevalence of leptospirosis, being notably higher in urban environments compared to rural ones (Castillo *et al*., 2016; Tabo *et al*., 2018; Abreu, 2022). This epidemiological pattern can be attributed, to a large extent, to the alteration of environmental and labor dynamics, where the reduction in agricultural work has directly impacted the incidence of leptospirosis in urban areas. However, it is imperative to recognize that the manifestation of this disease remains closely linked to individual risk activities (Castillo *et al*., 2016; Torres *et al*., 2016; Zambrano *et al*., 2017).

At a global level, a similar trend is observed in urban environments, where the combination of unfavorable socioeconomic conditions, poor hygiene conditions and the accumulation of waste in public spaces has led to a significant increase in the rodent population. This increase, in turn, contributes to the spread of leptospirosis, highlighting the importance of addressing not only individual factors, but also environmental determinants that influence the transmission of this disease (Zambrano *et al*., 2017; Dhewantara *et al*., 2020).

These results agree with those obtained by Patiño *et al*. (2010) and Garcia *et al*. (2013) who reported a greater occurrence of the disease in urban areas. However, they contrast with those obtained by Carreño *et al*. (2017), who state that the disease occurs mostly in rural areas.

Table 3 reflects the distribution of human leptospirosis according to health areas and the incidence rates found in the period analyzed.

Table 3 Distribution of human leptospirosis according to health areas in the period 2001-2022 in the Santa Clara municipality

Health Areas	Cases	Percent	Incidence Rate/ 100 000 habitants
A	21	18.5	45.0
B	14	12.3	53.8
C	29	25.6	51.7
D	21	18.5	90.2
E	9	7.9	40.3
F	19	16.8	26.6
Total	113	100.0	46.1

Legend: A: "Chiqui Gómez" Polyclinic, B: "José Ramón León Acosta" Polyclinic, C: "Captain Roberto Fleites" Polyclinic, D: "Marta Abreu" Polyclinic, E: "Santa Clara" Polyclinic and F: "20" Polyclinic Anniversary".

The largest number of sick people was located in the "Captain Roberto Fleites" health area 25.6% (29 cases out of 113), because it covers a larger universe, rural and urban; However, the "Marta Abreu" Polyclinic presented the highest incidence rate (90.2 per 100,000 inhabitants).

Figure 2 shows the seasonality of the occurrence of human leptospirosis in Santa Clara during the analyzed period.

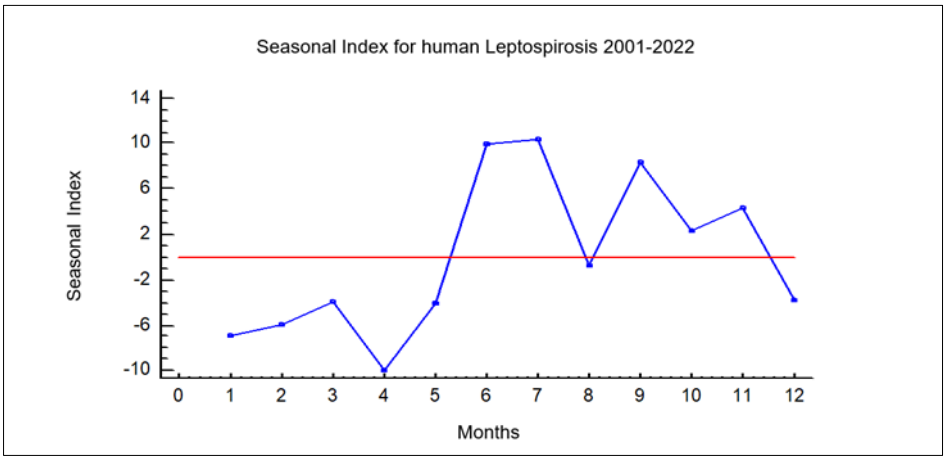


Figure 2 Seasonality indices for the monthly occurrence of leptospirosis

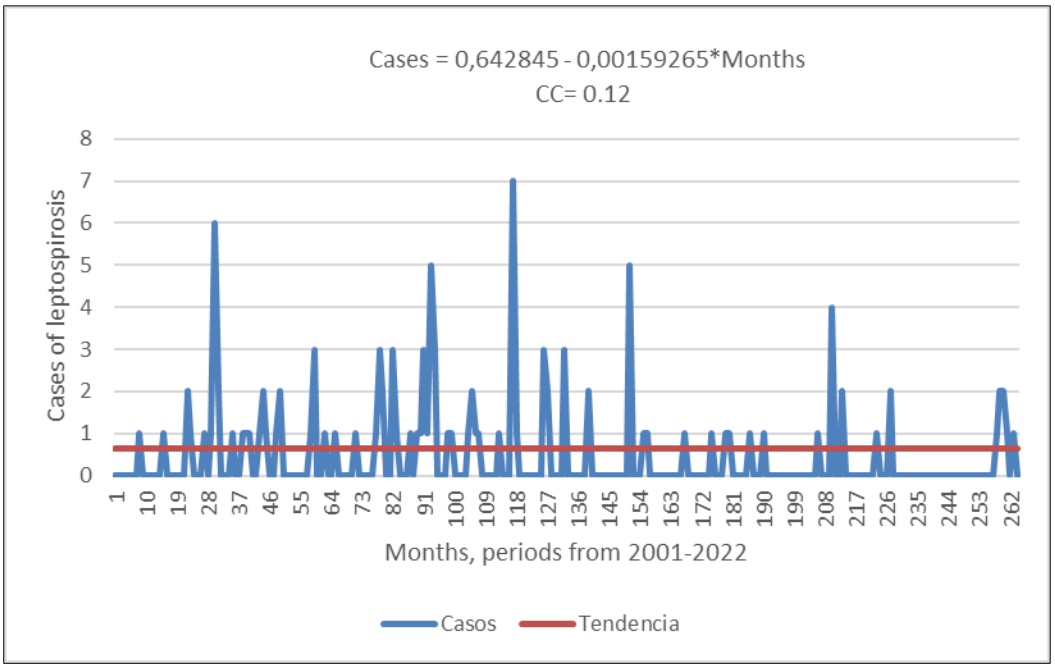
The figure displays the results of the seasonal indices for the monthly occurrence of human leptospirosis in the period 2001 - 2022; Note that there is a seasonal balance in the occurrence of human leptospirosis throughout the year, with the lowest index -9.96 in the month of April and the maximum of 10.37 in the month of July (Castillo *et al*., 2016; Lazo *et al*., 2017; Ortiz *et al*., 2019). The occurrence of leptospirosis is greater in the months of June, July and September, its indices are higher than 0 than in an average season (Castillo *et al*., 2016; Obregón, 2023).

The months with the lowest occurrence of cases were framed in the dry period. The months of greatest occurrence were June, July and September, which coincide with the rainy period in Cuba (May-October), results that are attributed to the fact that in this period the high humidity and temperature favor the proliferation of leptospires in the ecological niches that They are contaminated by the urine of sick animals, carriers and reservoirs. However, leptospirosis can occur at

any time of the year and may be conditioned by other factors such as disaster prevention and mitigation measures, immunoprophylaxis programs, staff training with educational intervention, and chemoprophylaxis in people exposed to sources of infection (Castillo *et al*., 2016; Zambrano *et al*., 2017; Abreu, 2022).

These results coincide with those obtained by Obregón (2023), who states that leptospirosis is more frequent during the rainy season favored by an increase in exposure to stagnant water. They also agree with studies carried out in different parts of the world (Carreño *et al*., 2017; Abreu, 2022; Muñoz, 2023; Serrano, 2023), where it is noted that the incidence of the disease is higher in the rainy season.

Figure 3 shows the occurrence of cases of human leptospirosis and its trend in the analyzed period.



Legend: cc: correlation coefficient

Figure 3 Occurrence of leptospirosis cases and their trend in the period 2001-2022

The occurrence of monthly leptospirosis has an irregular behavior with peaks in the month of June 2003, September 2008 and the month with the highest number of cases was September 2010. And the trend is to be maintained. This irregular behavior over time reflects the endemic behavior of human leptospirosis (Castillo *et al*., 2016; Lazo *et al*., 2017; Zambrano *et al*., 2021). The tendency to neither increase nor decrease in the number of cases is attributed to the fact that there is an underreporting of diagnosed cases, which leads to the underestimation of the true magnitude of this disease (Castillo *et al*., 2016; Obregón *et al*., 2018; Zambrano *et al*., 2021).

It is imperative to recognize, likewise, that the spectrum of leptospirosis is not limited solely to the clinical dimension of the disease, but rather encompasses a range of socio-environmental and behavioral influences. Other elements that influence this behavior are prevention measures, such as selective vaccination, which is aimed at populations at specific risk, and training for health professionals and the community in general. In addition, educational interventions that promote awareness and encourage appropriate hygienic practices play a vital role in the prevention and control of leptospirosis in this territory (Pérez *et al*., 2017; Ortiz *et al*., 2018; Obregón, 2023).

Table 4 shows the main epidemiological indices of human leptospirosis in the studied population. The mortality rate found corresponds to values found in the majority of studies carried out in Cuba where up to 83 cases have been reported in a study period from 2015 to 2022 (Obregón, 2023). In Mexico Torres *et al*. (2016) report a mortality that exceeds 10%.

Table 4 Epidemiological indices of human leptospirosis in Santa Clara during the analyzed period

Susceptibles	Sicks	Deaths	Fatality / 100 000	Incidence / 100 000	Mortality / 100 000
244 661	113	21	18.58	46.18	8.5

PAHO (2015) reports that the majority of registered cases have a severe manifestation, which is why the fatality rate is greater than 10%. The incidence rate found in this study is higher than that found by other researchers in studies carried out in other regions of America (García *et al*., 2013; Torres *et al*., 2016; Carreño *et al*., 2017). Zambrano *et al*. (2021) in the canton of Santa Ana, Manabí province, Ecuador found a rate of 36.6 / 100,000 inhabitants and in the entire province of Portoviejo of 22.0 / 100,000 inhabitants during the year 2014, and throughout the period analyzed (2014-2017) the incidence rate in the province of Manabí was 12.7 per 100,000 inhabitants.

In 2011, reports that the average annual incidence of human leptospirosis in endemic countries is five cases per 100,000 inhabitants (WHO, 2011). Other studies suggest that the African Region is the one that has reported the highest incidence values (95.5 per 100,000 inhabitants) of leptospirosis in recent years, followed in descending order by the Western Pacific area with a rate of 66.4, the Americas with 12.5, Southeast Asia with 4.8 and Europe with 0.5. In some areas of the western Pacific, the incidence is as high as 975 cases per 100,000 (WHO, 2011).

Figure 4 shows the year 2023 (solid red line) and its comparison with the expected behavior or endemic channel based on the annual series for the period 2001-2022 in Santa Clara.

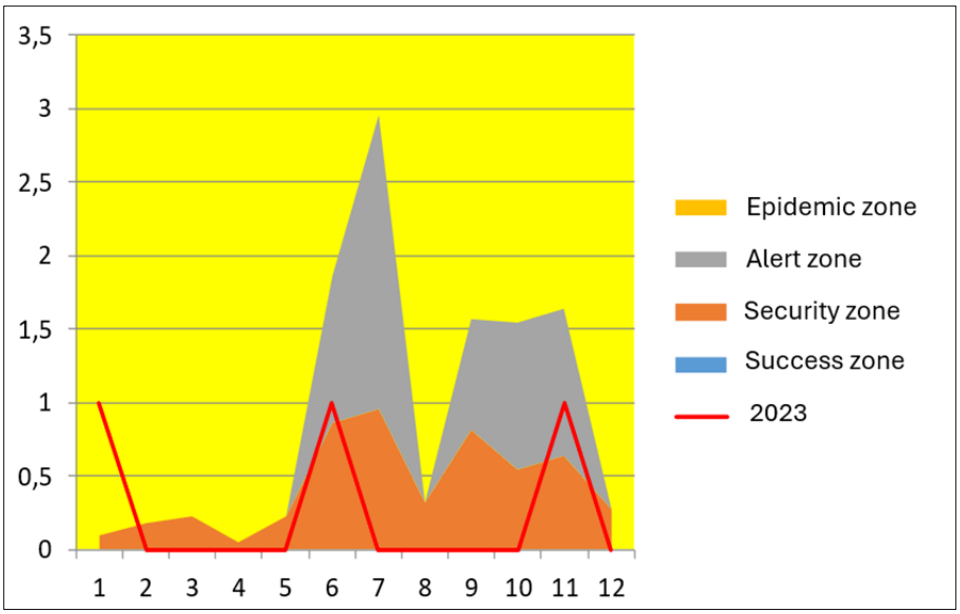


Figure 4 Endemic channel of the monthly occurrence of human leptospirosis in Santa Clara during the period 2001 – 2022 and occurrence of monthly cases in 2023

Legend: X axis: months; Y axis: cases.

Note that, by superimposing the case occurrence records for the year 2023 on the historical behavior data of the remaining 21-year series, it is shown that, in the months of January, June and November, the occurrence of human leptospirosis behaved by above the expected behavior or endemic channel, that is, in the epidemic zone for the month of January and the alert zone for the month of June and November.

As can be seen, the usual behavior channel for the period analyzed for the occurrence of cases is very low because in many months the incidence is zero. The endemic channel of human leptospirosis in the municipality studied is from zero to one case per month. This phenomenon is attributed, in part, to the efficient healthcare infrastructure in Cuba (Castillo *et al*., 2016; Lazo *et al*., 2017; Obregón *et al*., 2018). Free and accessible health services guarantee early detection and timely treatment of cases, essential factors to contain the spread of the disease. In addition, the country

has successfully implemented a vaccination program, thus contributing to the prevention of leptospirosis and reducing its impact on the population (Lazo *et al*., 2017; Obregón *et al*., 2018; Ortiz *et al*., 2019).

Among the occupational categories, students, housewives and agricultural workers stand out as the predominant groups affected by the disease. These findings are explained by the exposure factors and the nature of the activities carried out by the people who make up these occupational categories. Likewise, the appearance of a higher percentage of cases with the disease occurs in housewives and agricultural workers, reasons attributed to exposure factors and the development of agricultural activities, which coincides with Castillo *et al*. (2016) and Pérez *et al*. (2017).

A critical aspect is highlighted in the context of immunization, because, in a group of 14 agricultural workers who were vaccinated, seven of them died despite having received the vaccine. This situation is attributed to several factors (Castillo *et al*., 2016; Obregón *et al*., 2018; Zakharova *et al*., 2021).

One of the underlying factors is that there are various leptospira serovars, and it is possible that these agricultural workers have been infected by leptospira serovars other than those contained in the vax-SPIRAL® vaccine, which is applied in Cuba. This biopharmaceutical product is a trivalent vaccine of Cuban origin that is obtained from inactivated leptospires by chemical methods and focuses on leptospira serovars of epidemiological importance in Cuba, specifically *canicola*, *icterohaemohrragiae* and *pomona* (Lazo *et al*., 2017; Obregón *et al*., 2018; Obregón, 2023). It is crucial to note that the immunity provided by this vaccine is not long-lasting and requires annual booster doses to maintain its effectiveness. The lack of systematicity in the vaccination schedule over the years, in combination with the possibility of exposure to serovars not covered by the vaccine, could have violated the immunity of these agricultural workers, therefore, the effectiveness of the vaccine. may have been limited in these cases (Pérez *et al*., 2017; Obregón *et al*., 2018; Obregón, 2023).

Another important factor is that leptospirosis can often affect people subclinically, meaning they have no obvious symptoms. This can lead to delays in seeking medical care, which in turn can result in serious complications if the disease progresses. This delay in medical care increases the risk of mortality in cases of leptospirosis (Pérez *et al*., 2017; Muñoz, 2023; Ordoñez, 2023).

Figure 5 reflects the frequency distribution of symptoms in people affected by leptospirosis in the period analyzed. The most frequent symptoms corresponded to fever (93.8%), headache (66.3%), arthralgia (64.6%) and myalgia (62.8%), which coincides with reports from other authors (Chavarría *et al*., 2015; Hernández *et al*., 2017; Aranzazu *et al*., 2020).

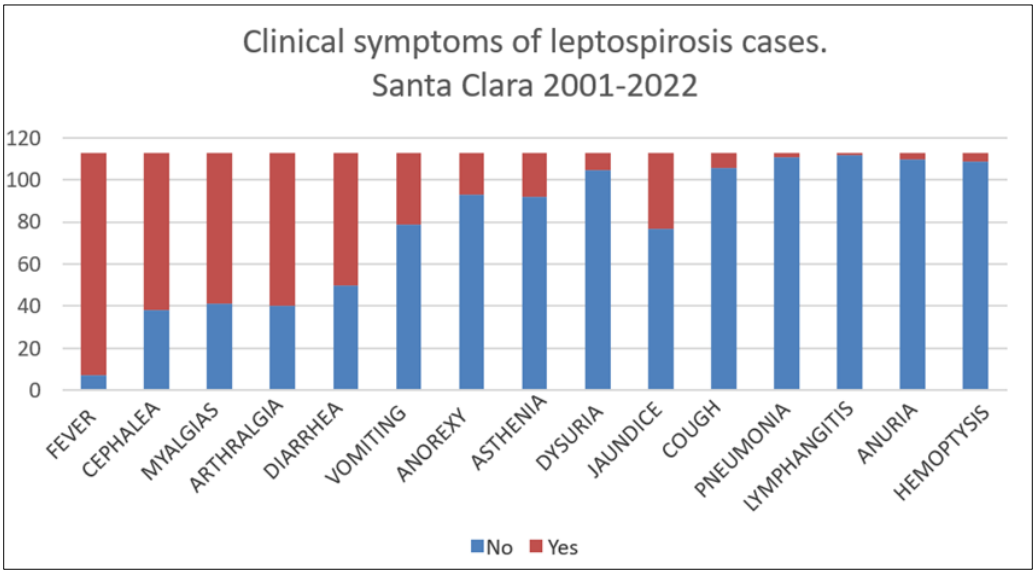


Figure 5 Frequency distribution of symptoms in people affected by leptospirosis in Santa Clara during the period 2001 – 2022

Legend: X axis: symptoms; Y axis: percentage.

These results differ with Ordoñez (2023) who, in a study carried out in Pinar de Río, Cuba, which covered a period of three years, found that the most frequent clinical manifestations of human leptospirosis were high fever, myalgias and

arthralgias in 100% of the cases, followed by catarrhal manifestations in 118 patients, which represents 72.84% of the total number of patients studied.

A very important aspect is the fact that afebrile and pediatric cases were confirmed as contributions to the epidemiology of this entity in the territory. Results that agree with a study carried out in Chile by Aranzazu *et al*. (2020), who carried out an analysis of the occurrence of cases of pediatric leptospirosis and found that approximately 30% of these cases were characterized by the absence of fever in its clinical presentation.

4 Conclusion

The incidence of human leptospirosis in the municipality of Santa Clara was high, mainly affecting the "Captain Roberto Fleites" and "Marta Abreu" health area. The age group with the highest number of cases was framed in patients aged between 15 and 59 years, with a predominance of the male sex. The most frequent symptoms in affected humans were headache, pyrexia, myalgia and jaundice and afebrile cases in pediatric age are described as contributions to the epidemiology in the territory. Human leptospirosis manifests a seasonal behavior with a tendency to persist.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest exists among the Authors.

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