

Edney Souto Pinto¹

 **0009-0002-2916-8491**

**Raila Souto
Pinto Menezes**²

 **0000-0002-2352-4777**

Victor Alves de Oliveira³

 **0000-0003-1039-7657**

Edilson Pereira de Freitas³

 **0009-0003-8116-3599**

¹ Escola de Saúde Pública do Ceará.
Fortaleza, Ceará, Brasil.

² Hemocentro Regional de Sobral.
Sobral, Ceará, Brasil.

³ Universidade Federal do Piauí.
Teresina, Piauí, Brasil.

¹ Prefeitura Municipal de Ipueiras.
Ipueiras, Ceará, Brasil.

DOI

10.54620/m791t927



Licença CC BY 4.0

Epidemiological profile of canine visceral Leishmaniasis cases in a municipality in the northern macroregion of the state of Ceará

Perfil epidemiológico dos casos de Leishmaniose visceral canina em um município na macrorregião norte do estado do Ceará

Perfil epidemiológico de casos de Leishmaniasis visceral canina en un municipio de la macrorregión norte del estado de Ceará

ABSTRACT

Visceral leishmaniasis is a notifiable disease caused by protozoa of the genus *Leishmania*. The uncontrolled growth of urban areas contributes to the proliferation of the vector. This study aimed to analyze the epidemiological profile of canine visceral leishmaniasis cases in the municipality of Ipueiras-CE from January 2023 to December 2025. Data from monitoring tests by the municipality's endemic diseases sector were used for statistical analysis. The results indicated that the number of tests performed in the municipality is insufficient (362 tests/year) to have an idea of the real epidemiological situation of the disease and that most cases occurred in the months of February to June in two neighborhoods (37.8%) in the city center. It is concluded that there is a need for investment in hiring Community Endemic Disease Agents to carry out the tests, as well as for health education actions with other health professionals and the population.

Keywords: Visceral Leishmaniasis; Epidemiology; Health Surveillance.

RESUMO

A Leishmaniose Visceral é uma doença de notificação obrigatória causada por protozoários do gênero *Leishmania*. O crescimento desordenado das áreas urbanas contribui para proliferação do vetor. O presente estudo objetivou analisar o perfil epidemiológico dos casos de Leishmaniose Visceral Canina no município de Ipueiras-CE no período de janeiro de

2023 a dezembro de 2025. Foram utilizados dados dos exames de monitoramento do setor de endemias do município para análise estatística. Os resultados apontaram que o número de testes realizados no município é insuficiente (362 testes/ano) para se ter ideia da real situação epidemiológica da doença e que a maioria dos casos ocorreu nos meses de fevereiro à junho em dois bairros (37,8%) na sede do município. Conclui-se a necessidade de investimento na contratação de Agentes Comunitários de Endemias para realização dos testes, como também de ações de educação em saúde junto aos demais profissionais de saúde e à população.

Palavras-chave: *Leishmaniose Visceral; Epidemiologia; Vigilância em Saúde.*

RESUMEN

La leishmaniasis visceral es una enfermedad de declaración obligatoria causada por protozoos del género *Leishmania*. El crecimiento descontrolado de las zonas urbanas contribuye a la proliferación del vector. Este estudio tuvo como objetivo analizar el perfil epidemiológico de los casos de leishmaniasis visceral canina en el municipio de Ipueiras-CE desde enero de 2023 hasta diciembre de 2025. Se utilizaron datos de las pruebas de vigilancia realizadas por el sector de enfermedades endémicas del municipio para el análisis estadístico. Los resultados indicaron que el número de pruebas realizadas en el municipio es insuficiente (362 pruebas/año) para tener una idea de la situación epidemiológica real de la enfermedad y que la mayoría de los casos ocurrieron entre febrero y junio en dos barrios (37,8%) del centro de la ciudad. Se concluye que es necesario invertir en la contratación de Agentes Comunitarios de Enfermedades Endémicas para realizar las pruebas, así como en acciones de educación sanitaria dirigidas a otros profesionales de la salud y a la población.

Descriptores: *Leishmaniasis visceral; Epidemiología; Vigilancia sanitaria.*

INTRODUCTION

The rapid growth of cities and the disorderly occupation of previously forested areas generate significant environmental impacts, such as the destruction of natural habitats and precarious sanitation and infrastructure, favoring the emergence of zoonoses resulting from the environmental imbalance caused by human activity¹. Among these diseases, leishmaniasis stands out as a major Public Health problem and is found in several regions of the world, especially in tropical and subtropical countries. In the Americas, a large share of cases occurs in Brazil, which has become one of the main centers of the disease. Initially restricted to rural and wild areas, Visceral Leishmaniasis has expanded into urban centers, reflecting changes in the pattern of transmission and creating new challenges for its control².

Leishmaniasis, also known as kala-azar, is a zoonosis caused by protozoa of the genus *Leishmania* and transmitted by the bite of female sandflies, popularly known as straw mosquitoes³. It can manifest in tegumentary and visceral forms, the latter being the most severe because it affects internal organs such as the liver and spleen⁴. The disease involves vertebrate hosts, such as dogs, cats, and humans, and invertebrate hosts, such as insects of the genus *Lutzomyia*, with domestic dogs standing out as the main reservoirs. Transmission occurs in both humans and animals through the vector's bite, which acts as the intermediate host in the disease cycle⁵. The proximity between infected dogs, sandflies, and human populations, especially in urban areas, intensifies the risk of transmission and sustains the cycle of the disease, requiring the adoption of integrated control strategies, such as vector control, proper management of infected animals, and health education actions⁶.

In recent years, Brazil has recorded an average of about 3,500 cases of visceral leishmaniasis per year, with an incidence of approximately 2 cases per 100,000 inhabitants, underscoring the persistence of the disease as a Public Health problem². The Northeast has the highest rates because of climatic conditions favorable to the vector, such as heat and humidity⁷. In Ceará, where the disease has been known since the 1930s and has been continuously monitored since 1986, 6,926 cases were confirmed between 2007 and 2022, with an annual average of 433 cases, highlighting the broad distribution of the disease in the state and the capital, Fortaleza, as the area with the highest number of notifications^{8,9}.

The high prevalence of leishmaniasis in dogs, associated with precarious socioeconomic conditions and the ownership of these animals, increases the risk of Human Visceral Leishmaniasis, causing a significant impact on Public Health¹⁰. In this context, epidemiological knowledge is essential for the development of control strategies, although studies indicate that many affected populations still lack basic knowledge about the disease, such as transmission, treatment, and prevention, and that research on the level of knowledge of health workers and endemic-disease control agents on this topic remains scarce¹¹.

In 2024, the municipality of Ipueiras, Ceará, recorded a canine population of 10,784 dogs, along with a significant increase in abandoned animals.

Combined with urban growth, deforestation, and the fragility of public policies aimed at animal welfare, this setting favors the spread of the Visceral Leishmaniasis agent, increasing human cases and stressing the urgent need for effective measures that combine sustainable urban development, environmental protection, and Public Health. In addition, the scarce volume of epidemiological studies on Canine Visceral Leishmaniasis in the municipality reinforces the need for research that could support disease-control actions.

This study is relevant because, identifying infected dogs – the main reservoirs of *Leishmania* – allows analyzing trends and fluctuations in cases, thereby contributing information for the control and possible eradication of Visceral Leishmaniasis. At the same time, by examining the situation in Ipueiras, Ceará, it seeks to support strategic management planning, assist professionals in understanding local vulnerabilities, and encourage public awareness. The study aimed to analyze the epidemiological profile of Canine Visceral Leishmaniasis, including the frequency and distribution of cases and the prevention and control measures adopted in the municipality.

METHODS

An epidemiological, descriptive, cross-sectional study was conducted. The epidemiological component investigates the distribution and determining factors of diseases or health conditions in specific populations¹². The descriptive component, in turn, is a research method based on the observation and description of behaviors, characteristics, or conditions of a population or event, without manipulating variables¹³.

The study was conducted in Ipueiras, Ceará, located in the Northwestern Ceará mesoregion and the Crateús microregion. The municipality has an estimated population of 38,285 inhabitants and a territorial area of 1,483.25 km²¹⁴. The region has a tropical semi-arid climate. The rainiest months are between January and April, with an average rainfall of 993 mm concentrated during this period. The vegetation belongs to the flora of the Ibiapaba Plateau and includes predominantly Caatinga, as well as Atlantic Forest, Amazonian Semideciduous Forest, and Cerrado vegetation. The average temperature in the region ranges from 25 to 26 °C, with highs of 38 °C and lows of 19.5 °C¹⁵. As a result of accelerated and disorderly human occupation, this original vegetation has gradually been replaced by deforested areas and residential construction that now make up the urban and housing landscape of Ipueiras, Ceará.

Primary Health Care (PHC) in Ipueiras, Ceará, consists of 15 Family Health Teams (ESFs) and one attached unit and predominantly adopts the ESF model in the composition of its teams. These teams are distributed across territories in both urban and rural areas. The municipality has 103 Community Health Workers (ACS) and 32 Endemic Disease Control Agents (ACEs). The municipality's Health Care Network (RAS) also includes support points such as the Health Academy, Polyclinic, Rehabilitation Center, Basic Pharmacy, and Psychosocial Care Center (CAPS)¹⁶. Data were collected from December 2025 to

January 2026. The study population consisted of CVL monitoring tests performed by the municipality's ACEs. CVL tests performed between January 2023 and December 2025 were included.

The data were extracted from the monitoring spreadsheets used by the Endemic Disease Service, which record the number of dogs suspected of CVL that were seen or monitored by the sector in Ipueiras, Ceará. The spreadsheet includes information such as the number of animals tested, test results (screening and serological tests), the number of euthanized animals, and the dogs' place of residence. These spreadsheets are completed by endemic disease control agents during visits to neighborhoods and localities in Ipueiras, Ceará. In cases in which the rapid tests were positive, the EDCAs collected blood from these dogs and sent it to the Central Public Health Laboratory in Tauá, Ceará (LACEN) for diagnostic confirmation. In the case of a positive serological test (ELISA), the endemic disease sector contacted the owner to communicate the result and explain the protocol for removing the dog positive for CVL (euthanasia).

According to the Ministry of Health, animals are considered positive when they show a reactive result on the Dual Path Platform immunochromatographic screening test (DPP®) and on the serological Enzyme-Linked Immunosorbent Assay (ELISA, confirmatory), as recommended by the Ministry of Health¹⁵.

The data extracted from the monitoring spreadsheets were compiled in Microsoft Office Excel® by year and month of collection, for subsequent analysis and presentation using descriptive statistics. The analysis considered the number of tests performed during the period, as well as the number of positive rapid and serological tests, the number of euthanized animals, the months with the highest occurrence of the disease, and the most affected areas of the municipality. Tables and graphs were used to present the results.

The study involved minimal risks, such as possible invasion of privacy, disclosure of confidential data, and exposure of information due to access to identification spreadsheets; however, measures were adopted to ensure confidentiality and restrict the use of data solely to what was necessary for the research, thereby minimizing such risks. In contrast, the study offers relevant benefits because the knowledge generated from the epidemiological data may support planning by managers and zoonosis surveillance professionals in CVL control in the municipality, in addition to contributing to preventive guidance for the population.

The study complied with Resolution N°510 of April 7, 2016, of the National Health Council, and the project was registered on Plataforma Brasil for evaluation by the Research Ethics Committee and received favorable Opinion N°7.562.807. Subsequently, the researcher visited the Endemic Disease Sector of Ipueiras, Ceará and presented the project to the coordinator of that service to begin data collection based on the spreadsheets made available with the relevant information.

RESULTS

The data obtained from the monitoring spreadsheets of the Endemic Disease Service, referring to the period from January 2023 to December 2025, indicated that 1,088 DPP screening tests were performed, of which 272 yielded reactive results for the disease. Blood samples were collected from 269 dogs with reactive results, and these serum samples were sent to the Central Public Health Laboratory (LACEN), located in Tauá, Ceará, for analysis using an ELISA immunoenzymatic assay as the confirmatory test. Thirty-eight of the analyzed samples were confirmed as positive for Canine Visceral Leishmaniasis (CVL). During the same period, 57 euthanasia procedures were conducted, as shown in the table below (Table 1).

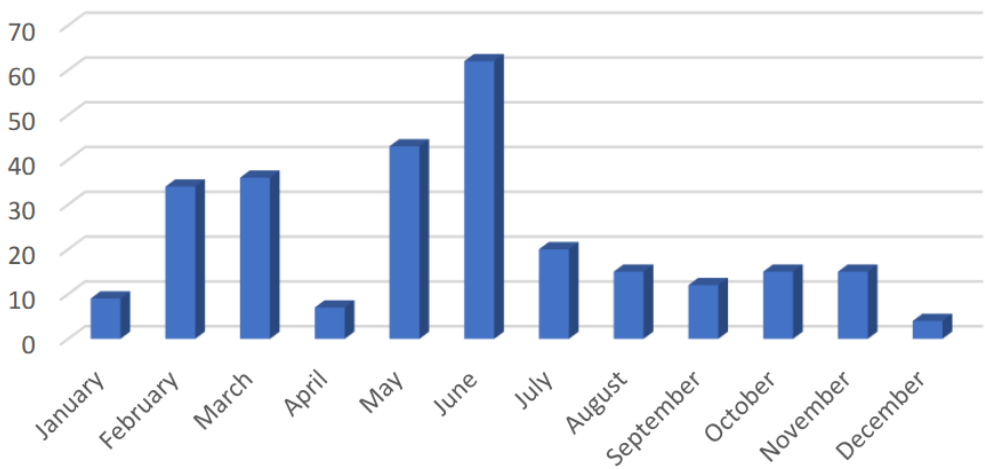
Table 1 – Number of DPP and ELISA tests performed, and number of dogs euthanized from January 2023 to December 2025 in the city of Ipueiras, Ceará.

DPP Tests Performed (January 2023 to December 2025)		ELISA Tests (January 2023 to December 2025)		No. of Dogs Euthanized (January 2023 to December 2025)
No. of Dogs Tested	Reactive	Performed	Positive	
1,088	272	269	38	57

Source: Endemic Disease Sector of the Ipueiras Municipal Health Department, 2025.

The monitoring spreadsheets also showed a higher incidence of CVL cases in the months of February, March, May, and June (Graph 1). Notably, these months correspond to the rainy season in the region, with a hot and humid climate that favors the proliferation of the sandfly and contributes to a greater occurrence of reactive tests for the disease.

Graph 1 – Number of dogs reactive to DPP by month from January 2023 to December 2025 in the city of Ipueiras, Ceará.



Captions: Number of dogs reactive to DPP by month from January 2023 to December 2025, January, February, March, April, May, June, July, August, September, October, November, December. Source: Endemic Disease Sector of the Ipueiras Municipal Health Secretariat, 2025.

The criteria adopted by the ACEs for selecting the investigated areas are based on regions with recurring annual notifications of canine cases, as well as on demand from the dogs' own owners, which results in rapid (DPP) tests that showed reactive results for CVL, as recorded in the monitoring spreadsheets. In these situations, the site where the test-positive animal was identified, as well as its adjacent areas, must be assessed to determine whether autochthonous transmission to other dogs occurred or whether the infection originated elsewhere.

Table 2 lists the regions in which cases of dogs reactive to the disease were recorded from January 2023 to December 2025, as well as the percentage represented by each region against the total number of cases recorded during the study period. Most cases were recorded in the Vila Nova neighborhood, with 52 cases (19.1%), and the Vamos-Ver neighborhood, with 51 cases (18.7%), both located in the municipal seat. Notably, both neighborhoods display conditions favorable to the reproduction and proliferation of the sandfly, including the lack of basic sanitation on some streets, vacant lots with accumulated garbage, and the raising of production animals such as chickens and pigs in unsuitable areas.

Table 2 – Number of cases by region during the period from January 2023 to December 2025 in Ipueiras, Ceará.

REGIONS WITH DPP-POSITIVE CASES		
Regions	Number of Cases	%
Vila Nova Neighborhood	52	19.1%
Vamos-Ver Neighborhood	51	18.7%
Pai Mané Settlement	24	8.8%
Downtown Neighborhood	22	8%
Oiticica dos Rosários	17	6.2%
Vila Sabóia	13	4.7%
Estação Neighborhood	12	4.4%
Cabeça da Onça	10	3.6%
Unha de Gato	8	2.9%
Lagoa do Arroz	7	2.5%
Baixa do Juá	6	2.2%
São José Neighborhood	4	1.4%
Vila Madeiro	4	1.4%
Ronca Settlement	3	1.1%
Beira do Rio	3	1.1%
Arraial	3	1.1%
Boa Esperança	3	1.1%
Balseiros	2	0.7%
Alazans District	2	0.7%
Vídeo dos Clementinos	2	0.7%
Nova Graça	2	0.7%
Arroz de Baixo	2	0.7%

Carnaúbas Neighborhood	2	0.7%
Floresta	1	0.3%
Barra do Coité	1	0.3%
Rua Projetada	1	0.3%
Charito District	1	0.3%
Melosa	1	0.3%
Cadoz	1	0.3%
Lagoa do Canto	1	0.3%
Iningas	1	0.3%
Trombeta Settlement	1	0.3%
Areias	1	0.3%
Papagaio de Baixo Settlement	1	0.3%
Livramento District	1	0.3%
Matriz District	1	0.3%
Pau Darco	1	0.3%
Garrotes	1	0.3%
América District	1	0.3%
Mirador	1	0.3%
Tucuns	1	0.3%
TOTAL	272	100%

Source: Endemic Disease Sector of the Ipueiras Municipal Health Department, 2025.

DISCUSSION

According to the Ceará State Health Secretariat (SESA-CE)¹⁷, the Ministry of Health recommends the use of two sequential serological techniques for the diagnosis of CVL: the immunochromatographic Rapid Test (RT), used to screen negative dogs, and the immunoenzymatic test (ELISA), used to confirm infection. Blood samples from dogs reactive on the rapid test must be sent to the Central Public Health Laboratory of Ceará (LACEN) for diagnostic confirmation. In the case of the municipality of Ipueiras, Ceará, serum samples are sent to the LACEN unit in Tauá, Ceará.

Municipalities in Ceará must conduct annual census-based or sample-based serological surveys (DPP RT for VL) in 40% of the dog population in municipalities with very intense, intense, high, medium, or low VL transmission during the year. In the case of Ipueiras, Ceará, where the canine population is approximately 10,784 dogs, the number of DPP tests that should be performed annually is 4,313 DPP rapid tests¹⁷. During the study period, 1,088 tests were performed, averaging 362 rapid tests per year, which is below the number recommended by SESA-CE.

This low annual number of rapid tests may be explained by the limited number of ACEs assigned to perform the tests. The municipality has a total of 32 ACEs; however, most of them are assigned to combat *Aedes aegypti* mosquitoes and triatomine bugs in the regions covered by the municipality, leaving only two agents to perform rapid testing in dogs.

Another justification for the low number of tests is that most were performed only in symptomatic dogs and at the request of the owners, thereby excluding asymptomatic dogs. Thus, this study evidenced the need to expand canine testing in the areas that make up the municipality, for both symptomatic and asymptomatic dogs, through an increase in the number of ACEs.

According to Coura-Vital¹⁸ and Lobo, Pond, and Galindo¹⁹, asymptomatic infected animals predominate in areas of active transmission and can infect sandflies, while often presenting a low parasite load that complicates diagnosis. Detecting asymptomatic cases in the study areas requires testing a significant portion of the canine population in those locations in order to understand whether these animals act as a silent source of infection for other dogs.

The number of rapid tests performed in Ipueiras, Ceará, was below the number recommended by SESA-CE, and this led to a reduced number of blood samples collected for ELISA serological testing. According to Table 1, 269 blood samples were collected, of which 38 dogs were confirmed seropositive for CVL by ELISA.

According to the Ministry of Health²⁰, CVL seroepidemiological surveys monitoring the presence of seroreactive dogs are essential for determining risk areas and for providing information that facilitates and streamlines the implementation of effective measures for the prevention and control of VL in both canine and human populations. In the context of this study, the setting described compromises the true epidemiological profile of disease cases in the municipality because of the reduced number of samples collected.

According to LACEN, the estimated turnaround time for the release of ELISA test results for CVL is 10 days²¹. However, in this study, we could not identify this information, as it does not appear in the spreadsheet used for case monitoring. The lack of this information is an important factor in disease monitoring and control in the municipality. A delayed release of these results may contribute to clinical deterioration in dogs awaiting results, potentially increasing morbidity and mortality in these animals and the risk to the population exposed to this transmission.

The months with the highest incidence of positive test results in dogs during the study period are explained by the vector's (sandfly) activity, which may vary according to region and climate, since transmission may occur throughout the year in areas where sandflies are more abundant, whereas transmission may be seasonal in other regions, with higher incidence during periods of greater humidity and higher temperatures²².

Regarding the regions most affected by CVL, the study found a predominance in the Vila Nova neighborhood, with 52 cases (19.1%), and Vamos-Ver, with 51 cases (18.7%). According to the Endemic Disease Service, epidemiological investigation showed that these neighborhoods have several characteristics that facilitate the proliferation of the sandfly and the spread of the disease, such as deforestation for housing construction, the raising of production animals such as pigs and chickens, some houses with open sewage, garbage

accumulation on abandoned lots, and large numbers of stray dogs and cats on the streets.

Gontijo and Melo²³ stress that, in addition to deforestation, environmental and climate changes, and the adaptation of vectors to altered environments are linked to the occurrence of the disease. Menezes et al.²⁴ report that the presence of domestic animals, chicken coops, fruit trees, remaining forest patches, and monoculture plantations near residences may attract sandflies. Added to this setting, the hot climate and humid spots in villages, as stated by Menezes et al.²⁵, “create favorable conditions for the reproduction of the mosquitoes that transmit the disease, increasing the risk of infection for humans and animals.”

The setting described highlights the need for greater reflection on CVL control and prevention measures among the stakeholders involved, namely managers, professionals, and the population in general.

One of the paths identified for improving VL prevention and control lies in the integrated organization of the services involved. The importance of reorganizing the work process of EDCAs necessarily involves their training and qualification. Another strategic action lies in the interaction of Health workers (ACS and ACE) in health education actions developed with communities in a contextualized and dialogic manner, stimulating popular participation in environmental and household control as measures to combat the transmitting agent²⁶. Other important stakeholders in this process are the multiprofessional residents working in the territories. One study showed that the inclusion of multiprofessional residents as active team members in the implementation of health surveillance actions and services contributes to improving the work process because of the potential for joint action between residents and surveillance²⁷.

CVL precedes the occurrence of the human form of the disease, reinforcing the importance of controlling the animal reservoir to address human visceral leishmaniasis²⁸. For this reason, it is important to implement public policies aimed at disease prevention, such as canine collaring programs. The canine collaring program seeks to strengthen VL surveillance and control actions through the use of collars impregnated with 4% deltamethrin, a repellent and insecticidal substance recognized by the World Health Organization (WHO), in order to curb disease incidence in dogs and, consequently, in humans²⁹.

Another point to be considered in the prevention of diseases such as leishmaniasis is Health Education. As an ongoing and participatory process, Health Education seeks to promote public awareness regarding the determinants of health, encourage the adoption of healthy behaviors, prevent disease, and promote health equity. Through educational strategies, information campaigns, lectures, discussion groups, and educational materials, health professionals can interact with individuals and communities, share knowledge, clarify doubts, and promote behavior change toward healthier living³⁰.

CONCLUSION

The study revealed significant challenges in the monitoring and control of CVL in the municipality investigated, highlighting weaknesses in the implementation of public policies. Notable challenges are the low volume of tests performed, the insufficient number of ACEs for control activities, and the lack of actions in the most affected areas. In addition, the study identified limitations in the CVL monitoring instrument, especially the lack of relevant information such as the time required for LACEN to release test results. In light of the findings, we recommend an increased investment in animal testing, that the work of ACS, ACE, and multiprofessional residents be strengthened with a focus on Health Education, and that new studies be encouraged to further examine these issues, thereby contributing to CVL control and to improved Public Health in the municipality.

REFERÊNCIAS

1. Pohren VD. Levantamento de casos de leishmaniose visceral canina no município de Parauapebas – PA [undergraduate thesis]. Areia: Centro de Ciências Agrárias, Universidade Federal da Paraíba; 2021. 42 p.
2. Brasil. Ministério da Saúde. Leishmaniose visceral [Internet]. Brasília, DF: Ministério da Saúde; 2024 [cited 2025 Nov 22]. Gov.br. Available from: <https://www.gov.br/saude/pt-br/assuntos/saude-de-a-a-z/l/leishmaniose-visceral>.
3. Fiocruz. Fundação Oswaldo Cruz. Leishmaniose [Internet]. 2025 [cited 2025 Nov 22]. Portal Oswaldo Cruz. Available from: <https://fiocruz.br/taxonomia-geral-05-doencas/leishmaniose>.
4. Opas. Organização Pan-Americana da Saúde. Leishmanioses: informe epidemiológico das Américas. Núm. 12, Dezembro de 2023 [Internet]. Washington, DC: OPS; 2023 [cited 2025 Nov 29]. OPAS. Available from: <https://www.paho.org/pt/documentos/leishmanioses-informe-epidemiologico-das-americas-num-12-dezembro-2023>.
5. Silveira NSD, Mendes EM, Pereira ML, Tavela A de O, Veiga APM, Zimmermann FC. Visceral Leishmaniasis in Dogs. *Acta Sci. Vet.* 2021;49. DOI: <https://doi.org/10.22456/1679-9216.106853>
6. Adamante D, Lazzari DA, Kehl LGB. Avaliação clínica e o resultado falso-negativo para leishmaniose visceral canina: Revisão. *Pubvet*;2023;17(11):e1485. DOI: <https://doi.org/10.31533/pubvet.v17n11e1485>
7. Brito FG, Langoni H, Silva RC, Rotondano TE, Melo MA, Paz GS. Canine visceral leishmaniasis in the Northeast Region of Brazil. *J Venom Anim Toxins Incl Trop Dis.* 2016;22:15. DOI: <https://doi.org/10.1186/s40409-016-0069-4>
8. SESA. Secretária de Saúde do Estado do Ceará. Boletim Epidemiológico. Leishmaniose Visceral Nº 1 23/11/2022. 2022 [cited 2025 Nov 22]. Available from: <https://www.saude.ce.gov.br/wp-content/uploads/sites/9/2018/06/Boletim-Epidemiologico-Leishmaniose-Visceral-23-11-2022.pdf>.

9. Paz JS, Pinheiro AQC, Ribeiro RL, Ferreira JLM, Silva LP. Epidemiologia da leishmaniose visceral no ceará entre 2011 e 2018. Cadernos ESP [Internet]. 19º de abril de 2021 [citado 21º de outubro de 2025];15(1):23-32. Disponível em: <https://cadernos.esp.ce.gov.br/index.php/cadernos/article/view/450>.
10. Baneth G, Koutinas AF, Solano-Gallego L, Bourdeau P, Ferrer L. Canine leishmaniosis - new concepts and insights on an expanding zoonosis: part one. Trends Parasitol. 2008;24(7):324-330. DOI: <https://doi.org/10.1016/j.pt.2008.04.001>
11. Gama MEA, Barbosa JS, Pires B, Cunha AKB, Freitas AR, Ribeiro IR, Costa JML. Avaliação do nível de conhecimento que populações residentes em áreas endêmicas têm sobre leishmaniose visceral, Estado do Maranhão, Brasil. Cad Saúde Pública 1998;14(2):381-90. DOI: <https://doi.org/10.1590/S0102-311X1998000200014>
12. Last JM. A Dictionary of Epidemiology. 3. ed. Oxford: Oxford University Press; 1995. 208 p.
13. Rouquayrol MZ, Almeida F. Epidemiologia e saúde. 6. ed. Rio de Janeiro: Guanabara Koogan; 2006. 736 p.
14. IBGE. Instituto Brasileiro de Geografia e Estatística. Cidades, Ipueiras [Internet]. 2022 [cited 2025 Sept 1]. Available from: <https://cidades.ibge.gov.br/brasil/ce/ipueiras/panorama>.
15. Ipueiras. Prefeitura Municipal de Ipueiras. O Município [Internet]. 2022 [cited 2025 Oct 23]. Available from: <https://ipueiras.ce.gov.br/omunicipio.php>.
16. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância Epidemiológica. Leishmaniose visceral: recomendações clínicas para redução da letalidade. Brasília, DF: Ministério da Saúde; 2011 [cited 2023 Oct 22]. 78 p. Available from: <https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/svsa/leishmaniose-visceral/manual-de-leishmaniose-visceral-recomendacoes-clinicas-para-a-reducao-da-letalidade/view>.
17. SESA. Secretária de Saúde do Estado do Ceará. Boletim Epidemiológico. Vigilância e Controle da Leishmaniose Visceral. Nº 1 21/02/2025. 2025 [cited 2025 Nov 29]. Available from: https://www.saude.ce.gov.br/wp-content/uploads/sites/9/2018/06/Boletim-LV-2024_1-.pptx.pdf.
18. Coura-Vital W. Estudo epidemiológico prospectivo em cães assintomáticos infectados por *Leishmania (Leishmania) Infantum* identificadores de biomarcadores de infecção [thesis]. Belo Horizonte: Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais; 2011. 169 p.
19. Lobo GLM, Pond MLB, Galindo RCG. Leishmaniose visceral em cães – revisão de literatura. Ciências da Saúde 2023;27, ed. 129. DOI: <https://doi.org/10.5281/zenodo.10410707>
20. Brasil. Ministério da Saúde.

Secretaria de Vigilância em Saúde.
Departamento de Vigilância
Epidemiológica. Manual de vigilância e
controle da leishmaniose visceral.
Brasília, DF: Ministério da Saúde; 2014
[cited 2023 Oct 15]. 120 p. Available
from:
https://bvsms.saude.gov.br/bvs/publicacoes/manual_vigilancia_controle_leishmaniose_visceral_1edicao.pdf

21. Ceará. Secretaria de Saúde.
Laboratório Central de Saúde Pública.
Manual de Coleta, Acondicionamento e
Transporte de Amostras para Exames
Laboratoriais. Elza Gadelha et al. (Org.)
5. ed. Fortaleza: SESA; 2021. Available
from:
<https://www.saude.ce.gov.br/wp-content/uploads/sites/9/2020/03/Manual-de-Coleta-Transporte-e-Acondicionamento-de-Amostras-2022.pdf>.

22. Rennó MC, Vasconcellos AO,
Santos RR, Silva ROS, Carneiro RA,
Paes PRO. Synovial fluid as an auxiliary
diagnostic tool for different stages of
canine visceral leishmaniasis. *Ciência Rural* 2019;49(5), e20190023.
<https://doi.org/10.1590/0103-8478cr20190023>

23. Gontijo CMF, Melo MN.
Leishmaniose Visceral no Brasil:
quadro atual, desafios e perspectivas.
Rev. Bras. Epidemiol. 2004;7(3):338-
49. DOI:
<https://doi.org/10.1590/S1415-790X2004000300011>

24. Menezes JA, Luz TCB, Sousa FF,
Verne RN, Lima FP, Margonari C.
Fatores de risco peridomiciliares e
conhecimento sobre leishmaniose
visceral da população de Formiga,
Minas Gerais. *Rev. Bras. Epidemiol.*
2016;19(2):362-74. DOI:

<https://doi.org/10.1590/1980-5497201600020013>

25. Meneses MEPD, Nascimento JCA,
Mendes MFS, Machado VAF, Silva
IRM. Levantamento epidemiológico
dos casos confirmados de leishmaniose
visceral canina no município de
Piripiri-PI, entre o período de 2017 a
2023. In: XV Semana de Iniciação
Científica, Inteligência Artificial:
Impactos sociais étnicos-legais, 2024.
Piripiri -PI. Available from:
<https://grcmlesydpdcd.objectstorage.saopaulo-1.oci.customer-oci.com/p/OQwcvnO-c63Oo8Gc2Kv4OTbJttj5ik6odguiDIyyQowuo5SWn-jHOLW9wNbylNqI/n/grcmlesydpdcd/b/dtysppobjmntbkp01/o/media/doity/submissoes/artigo-005cb4138932d5d7a66b02e0f187f6b02f56f5fa-arquivo.pdf>.

26. Barbosa MN, Luz ZMP, Carmo RF.
Conhecimento, atitudes e práticas em
leishmaniose visceral: reflexões para
uma atuação sustentável em município
endêmico. *Rev. APS.* 2017; 20(4): 565-
574. DOI:
<https://doi.org/10.34019/1809-8363.2017.v20.16066>

27. Santos, J.F. et al. Atuação do
Residente Multiprofissional em Saúde
Coletiva Frente à Vigilância em Saúde.
Revista Interdisciplinar em Saúde
2022;9(único):761-776. DOI:
<https://doi.org/10.35621/23587490.v9.n1.p761-776>

28. Sena LAC, Vaz JLS, Costa SCR,
Lima Verde RMC, Macêdo KPC,
Nascimento MH et al. Avaliação
epidemiológica da leishmaniose
visceral no município de Imperatriz -
MA entre os anos de 2012 e 2017. *REAS*
2020;(49):e763. DOI

<https://doi.org/10.25248/reas.e763.2020>

29. Brasil. Ministério da Saúde. Nota Técnica Nº 5/2021-CGZV/DEIDT/SVS/MS. Trata-se da proposta de incorporação das coleiras impregnadas com inseticida (deltametrina a 4%) para o controle da leishmaniose visceral em municípios prioritários [Internet]. Brasília, DF: Ministério da Saúde; 2021 [cited 2023 Dec 15]. 56 p. Available from: [https://www.gov.br/saude/pt-](https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/notas-tecnicas/2021/nota-tecnica-no-5-2021-cgzv-deidt-svs-ms.pdf/view)

Corresponding Author

Edney Souto Pinto
edney34@gmail.com

Author Contributions

Project administration: ESP; **Formal analysis:** ESP, RSPM; **Conceptualization:** ESP; **Data curation:** ESP, RSPM; **Writing – review & editing:** ESP, RSPM, VAO; **Investigation:** ESP; **Methodology:** ESP; **Resources:** ESP; **Writing – original draft:** ESP; **Supervision:** RSPM.

Conflict of Interest

The authors declare no conflicts of interest.

Funding

This study was self-funded.

[br/centrais-de-conteudo/publicacoes/notas-tecnicas/2021/nota-tecnica-no-5-2021-cgzv-deidt-svs-ms.pdf/view](https://doi.org/10.25248/reas.e763.2020)

30. Bittencourt FB, Fialho LMF, Ponce HH. Educación a distancia en escuelas públicas de educación secundaria: percepción de los docentes. Rev. Temas em Educação, 2020;29(1):24-41. DOI: <https://doi.org/10.22478/ufpb.2359-703.2020v29n1.51753>

Associate Editors

Bruno Neves da Silva, Genilton da Silva Faheina Junior, Janaildo Soares de Sousa e Sofia de Moraes Arnaldo

How to Cite

Pinto ES, Menezes RSP, Oliveira VA, Freitas EP. Epidemiological profile of canine visceral leishmaniasis cases in a municipality in the northern macroregion of the state of Ceará. Cadernos ESP. 2026;20:e2557.

Received: January 29, 2026

Published: July 17, 2026