Epidemiological profile of visceral leishmaniasis in a state in northeastern Brazil: historical series of a decade

Perfil epidemiológico da leishmaniose visceral em um estado do nordeste do Brasil: série histórica de uma década

Perfil epidemiológico de la leishmaniasis visceral en un estado del noreste de Brasil: una serie histórica de una década

José Orlando Sousa[1], Karinna Alves Amorim de Sousa[2], Inara Viviane de Oliveira Sena[2], Lorena Braz de Oliveira[3], Layze Braz de Oliveira[4], Antônio Filho Alves Rodrigues[1], Telma Maria Evangelista de Araújo[2]

[1] Higher Education Association of Piauí, Department of Nursing, Teresina, Piauí, Brazil.

[2] Federal University of Piauí, Department of Nursing, Teresina, Piauí, Brazil.

[3] Federal University of Piauí, Department of Pharmacy, Teresina, Piauí, Brazil.

[4] University of São Paulo, College of Nursing of Ribeirão Preto, Fundamental Nursing, Ribeirão Preto, São Paulo, Brazil.

ABSTRACT

Introduction: Visceral leishmaniasis (VL) is an infectious disease that can cause cases of lethality in men in the absence of timely treatment. The objective of the study is to describe the epidemiological profile of human Visceral Leishmaniasis in a state in northeastern Brazil. **Outline:** Descriptive epidemiological study performed through survey in Information System for Notifiable Diseases. Data were collected in October 2019, referring to the years 2008 to 2018 (n=2573). The incidence rate was calculated, and descriptive analyses of sociodemographic and clinical variables of the cases were performed. **Results:** 2573 visceral leishmaniasis cases were reported in 10 years in the State of Piauí, and the highest incidence detected was in 2014 (9.89%), male. As for outcome, 52.35% cure rate was verified, the high death rate stands out (6.49%). **Implications:** Piauí remains endemic in Brazil, execution of more effective actions in combat is necessary, focusing on early identification of cases, investment in population education to attenuate the transmission and thus reduce the number of cases of the disease in the State.

DESCRIPTORS

Epidemiology; Zoonoses; Leishmaniasis, Visceral.

Corresponding author:
Karinna Alves Amorim de Sousa
Address: Universidade Federal do Piauí – UFPI, Campus Universitário Ministro, Petrônio Portella, Bairro Ininga.
CEP 64049-550 – Teresina, Piauí, Brazil
E-mail: karinnaduda@gmail.com

INTRODUCTION

Visceral leishmaniasis (VL) affects almost two million people annually and is among the six endemic diseases considered priority in the world. This demonstrates that in the 21st century, VL remains as a big public health problem, with high mortality rates, especially in developing countries such as Brazil.[1]

The epidemiology of visceral leishmaniasis in the Region of Americas is complex, and it is endemic in 12 countries. According to World Health Organization from 2001 to 2017, in this region, 59,582 new VL cases were recorded, and of these approximately 96% (57,582) were identified in Brazil, it is important to note that South American countries such as Argentina, Colombia, Paraguay and Venezuela are among those with high records of cases.[2-3] In Northeast, this infection is endemic, with epidemic peaks in urban areas. In the state of Piauí, the number of recorded cases from 2012 to 2015 reached 954, with an average of 238.5 cases per year and average incidence in the period of 7.48 cases/100,000 inhabitants.[4]

The species that are vectors of this aggravation are *Lutzomyia longipalpis* and *Lutzomyia cruzi*. Such vectors carry the protozoa *Leishmania* (L.) *chagasi*, which in its turn transmits the disease through phlebotomine female bite. The infection process occurs during hematophagy. The clinical manifestations in man involve anemia, long-lasting fever, weight loss, among other symptoms. In dog, the disease manifests through apathy, weight loss, intermittent fever, ulcers on skin (face, nose, ear, and extremities), furfuraceous scaling, exaggerated nail growth and bloody stools.[4-5]

Despite being initially characterized as a strictly rural infection, currently, this disease has reached great proportions in urban centers, in different Brazilian regions, showing high incidence and high lethality, especially among untreated individuals, malnourished children and patients carrier of other diseases such as Human Immunodeficiency Virus (HIV) infection.[6]

The highest probability of infection occurs in function of vulnerabilities such as precarious sanitation infrastructure, aspects such as immigration of canine and human population carriers of parasite to non-endemic areas, socioenvironmental changes, breeding of animals that act as parasite reservoirs, anthropic action, favorable climatic conditions for proliferation of the vector, vegetal cover with predomination of fructiferous trees, disordered growth of urban areas with accumulation of organic matter as well as negligence of the first symptoms of the disease.[7-8]

With a view to minimize the transmission of VL, Brazilian government instituted the Visceral Leishmaniasis Control Program (PCLV) in order to reduce the lethality, incidence, mortality and morbidity rate of the disease through diagnosis and early treatment. Moreover, strategies were built to control the transmission through vectors and reservoir.[9]

Northeast is a region of high prevalence of the disease. Based on this problem, the present study aims to describe the epidemiological profile of human Visceral Leishmaniasis in a state in northeastern Brazil.

METHOD

It is a descriptive, epidemiological study, performed through survey in database. Data were collected in October 2019 and refer to the years of 2008 to 2018. The study was carried out in the state of Piauí, of which the population is 3,273,227 inhabitants, located in northeastern Brazil.[10]

The following variables were included for the analysis: reporting year, sex, age, ethnicity, schooling, and disease evolution with a view to define the epidemiological profile and discuss the incidence of cases in the state, in the period from 2008 to 2018

and unofficial data excluded, which took into consideration underreported cases.

Data were collected by the researchers themselves, who are part of State Management of Health Care of the State, through database available in System for Notifiable Diseases – SINAN, this is fed, mainly, by the report and investigation of cases of diseases and aggravations on the national list of diseases of compulsory notification.

After the collection, the entering of data in the spreadsheet software Excel® was proceeded. Simple descriptive analysis was performed, the analysis of data from SINAN was carried out by TABWIN software.
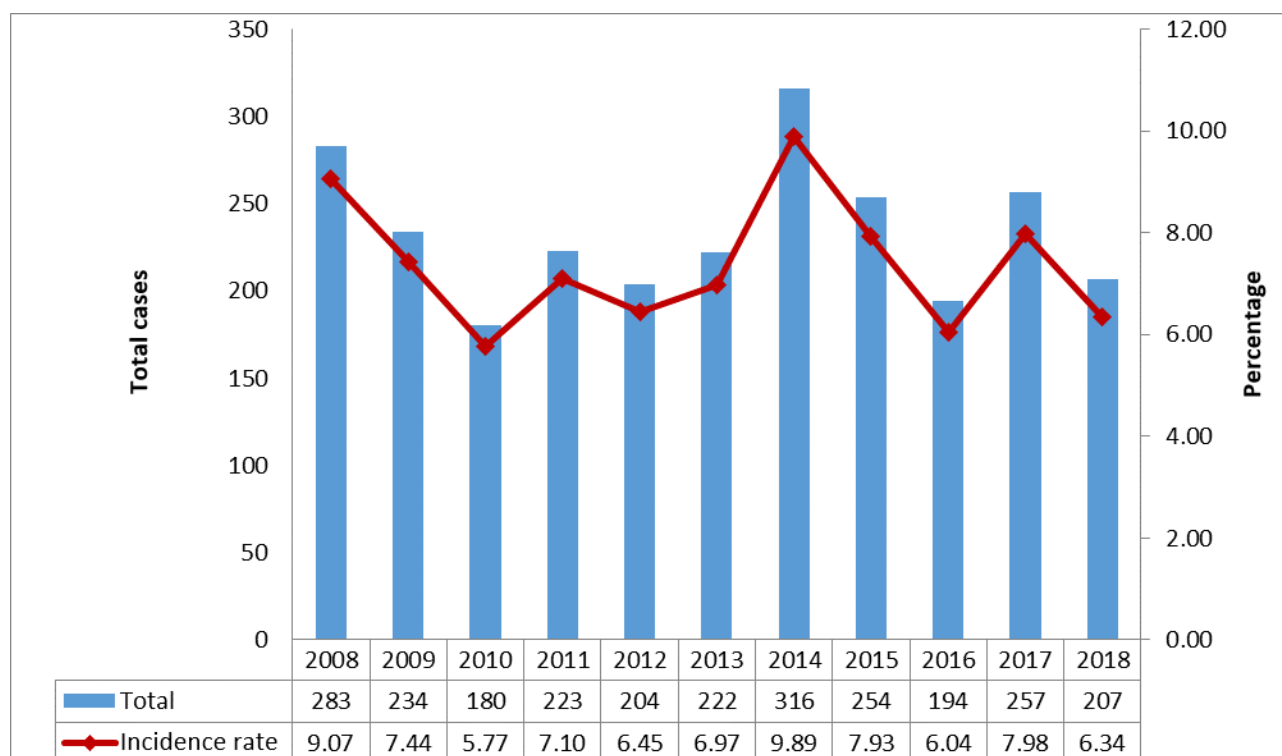
The discussion of data was made based on scientific production on the subject. As the study was performed from a public domain database, submission to Research and Ethics Committee was not necessary. However, it was submitted for approval by Institution (Piauí State Health Department/Surveillance and Health Care Directorate) that gave access to the database.

This study was not assessed by a Research and Ethics Committee since it was based on Resolution No. 510, April 07, 2016, of National Health Council.[11] Nevertheless, it is worth mentioning that all the ethical precepts for national and international research were followed.

RESULTS

2573 visceral leishmaniasis cases were recorded between the years of 2008 to 2018. From the analysis of database on the reported cases, in 2014, the greatest number of diagnosed individuals was identified with a total of 316 cases with incidence 9.89, and the least number was in 2010, with 180 cases and an incidence of 5.77. The results indicate a heterogeneous increase in prevalence of this infection in historical series (Chart 1).

Chart 1 – Distribution of visceral leishmaniasis incidence per year in the city of Piauí – 2008 to 2018. (N=2,573). Piauí, Brazil, 2019.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	283	234	180	223	204	222	316	254	194	257	207
Incidence rate	9.07	7.44	5.77	7.10	6.45	6.97	9.89	7.93	6.04	7.98	6.34

In relation to the subject profile, the predominance of males – 67.0% (n=1724) was verified. Ages varied between under 1 year to over 80 years, the highest frequency of people infected in the age group under 9 years – 42.24% (n=1087) was observed, followed by those between 20-34 years – 19.62% (n=505). (Table 1).
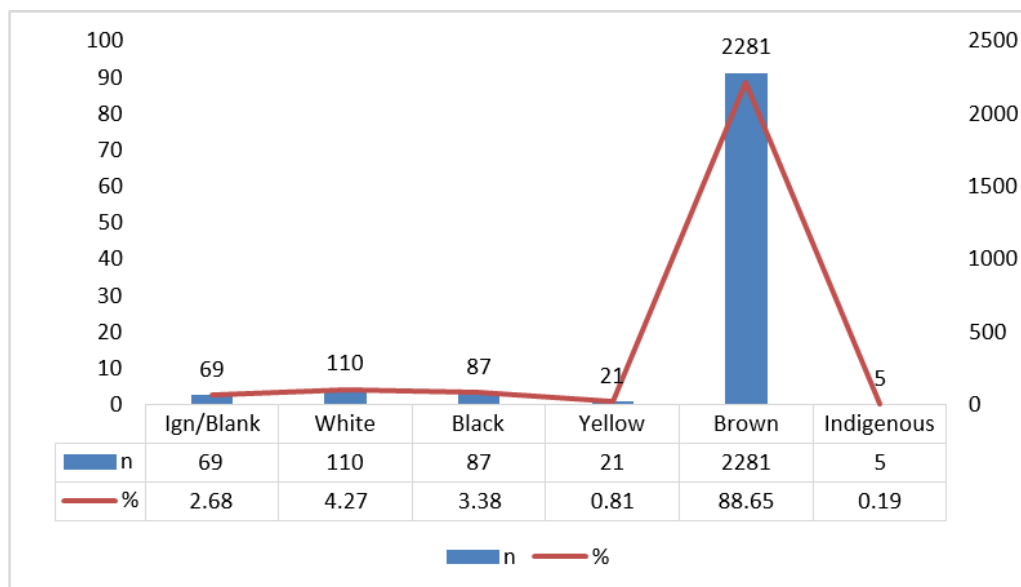
Table 1 – Distribution of visceral leishmaniasis cases on sex and age group in the city of Piauí – 2008 to 2018. (N=2,573). Piauí, Brazil, 2019.

Variables	n	%
Sex		
Male	1724	67
Female	849	33
Age group (years)		
≤ 9	1087	42.24
10–19	214	8.30
20–34	505	19.62
35–49	395	15.40
50–79	354	13.74
80 and +	18	0.70

Regarding ethnicity, 88.65% (n=2281) of individuals were brown, followed by white and afro-descendant, 4.27% (n=110) and 3.38% (n=87) respectively. Lower percentages were found in yellow 0.81% (n=21) and indigenous 0.19% (n=5). (Chart 2).
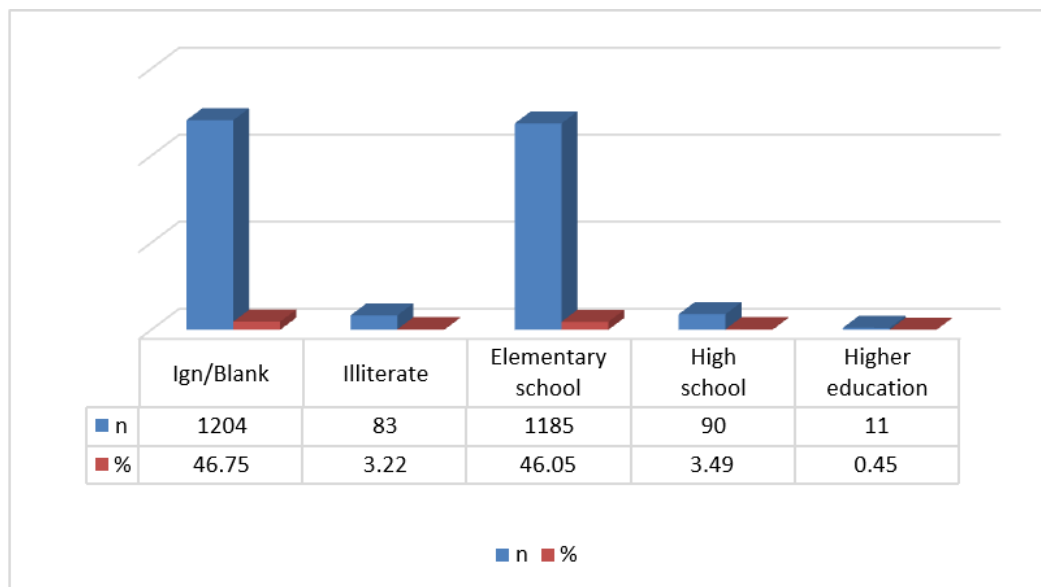
Chart 2 – Distribution of visceral leishmaniasis on race in the city of Piauí – 2008 to 2018. (N=2,573). Piauí, Brazil, 2019.

	Ign/Blank	White	Black	Yellow	Brown	Indigenous
n	69	110	87	21	2281	5
%	2.68	4.27	3.38	0.81	88.65	0.19

According to Chart 3, the highest frequency of visceral leishmaniasis cases was in individuals with elementary education – 44.87% (n=46.05) and with high education – 3.49% (n=90), the higher education was the one that showed the least number of reported cases – 0.45% (n=11). The number of blank and ignored cases was 46.75% (n=1204). (Chart 3).
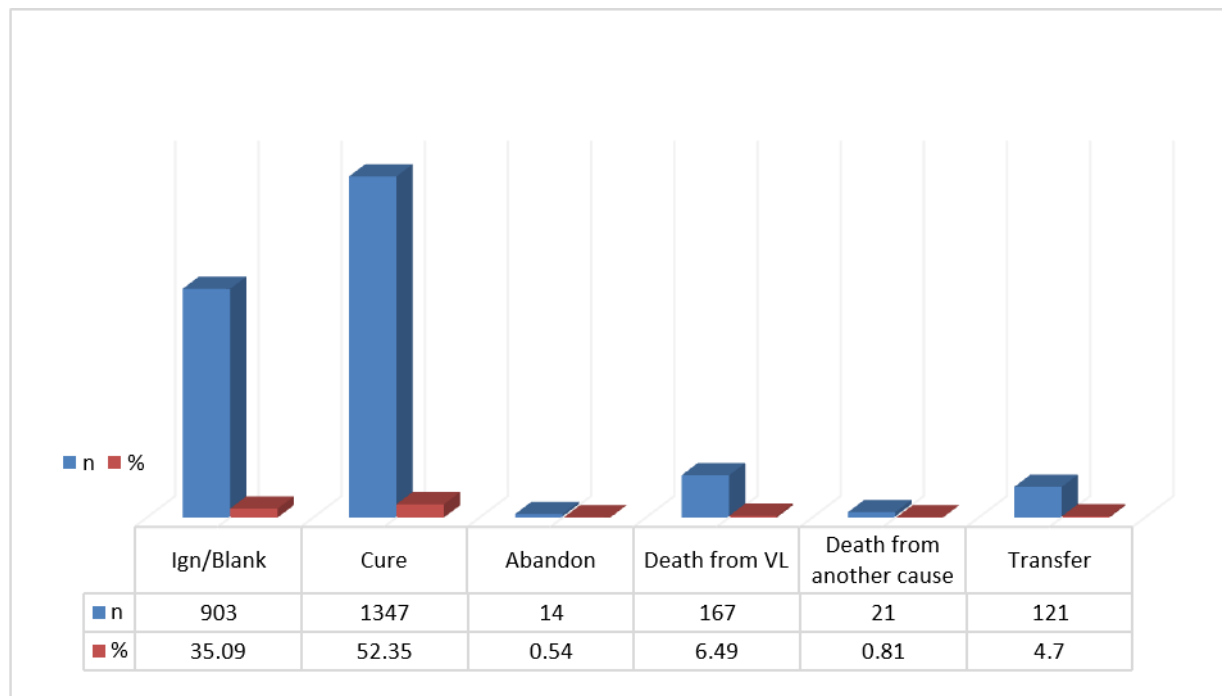
Chart 3 – Distribution of visceral leishmaniasis on schooling in the city of Piauí – 2008 to 2018. (N=2,573). Piauí, Brazil, 2019.

	Ign/Blank	Illiterate	Elementary school	High school	Higher education
■ n	1204	83	1185	90	11
■ %	46.75	3.22	46.05	3.49	0.45

■ n ■ %

By analyzing the case outcome, a cure rate of 52.35% (n=1347) was verified, death cases by visceral leishmaniasis – 6.49% (n=167) and abandonments – 0.54% (n=14) stand out. The number of blank and ignored cases is worth noting with a percentage of 35.09% (n=903). (Chart 4).

Chart 4 – Distribution of visceral leishmaniasis on case outcome in the city of Piauí – 2008 to 2018. (N=2,573). Piauí, Brazil, 2019.

■ n ■ %

	Ign/Blank	Cure	Abandon	Death from VL	Death from another cause	Transfer
■ n	903	1347	14	167	21	121
■ %	35.09	52.35	0.54	6.49	0.81	4.7

DISCUSSION

Epidemiological overview of visceral leishmaniasis demonstrated a heterogeneous growth of the number of cases over the historical series with an incidence peak in 2014. This infection mostly affects male children, about half obtained cure as outcome.

The results demonstrated higher VL frequency in males, which is not in function of more susceptibility, but, probably, in function of more exposure to phlebotomine vectors. Predisposition related to genre and age for the infection by VL may vary from society to society, depending on predominant tendencies of division of domestic work. In sporadic and epidemic VL cases, people of all age groups are susceptible, and men are at least two times more prone to contract the disease than women.[12-14]

In endemic areas, children under 15 years of age are commonly affected, especially due to their immature immune system, which may also be associated with more frequent contact of children with animals, in addition to their greater nutritional deficiency, and it is the same reality observed in this study. A similar situation occurs in the country, in which the disease reaches mostly the infant population with greater incidence in the six first years of life.[15-17]

Referring to race/color, visceral leishmaniasis was the most predominant in brown color. There are no studies that associate the risk of acquiring visceral leishmaniasis by ethnicity; however, a study on the epidemic of VL in another northeastern state found that black individuals with low education were the most affected by the disease, determining a distinct pattern of the study, in which most individuals affected self-declared brown. Furthermore, in Brazil, ethnicity is self-declared, and in Northeast, there is a predominance of brown color in population.[18-19]

In the present study, it was verified that more than 50% of cases of the disease reported in the period in study occurred in individuals with elementary education. Studies performed in Northeast in Brazil, in Bahia and in Ceará indicate similar results in which a high incidence of this infection was identified among individuals with low level of education. It is conjectured that the individual who never attended school, or who classifies himself as illiterate, is eight times more likely to be affected by visceral leishmaniasis than a literate individual, given that the precariousness of basic sanitation and of life conditions help in exposing the population to risk factors of the disease.[20-22]

Concerning clinical evolution of visceral leishmaniasis cases, the large proportion of cure in reported cases can be justified by the preparation of health staff in outcome and follow-up of cases as well as by early onset of treatment. It is necessary to warn the high percentage of death by the disease in the period analyzed, as there are diagnostic tests and treatment available in the public health system, in this way, the lethality need to be better discussed for the establishment of efficient measures to control VL in the state of Piauí.[23] A study performed in the state of Maranhão indicates a similar result, in which the existence of a high number of deaths by visceral leishmaniasis is emphasized.[24]

Despite the possibility of prevention and treatment, the number of deaths associated with this infection still draws attention, the signs of bad prognostics involve hemorrhage, the presence of jaundice, coinfection by HIV, thrombocytopenia, age < 5 and age > 40-50 years, diarrhea, dyspnea, severe neutropenia, and infections. A multicenter study performed in five regions of Brazil indicated that the treatment with amphotericin B deoxycholate and liposomal amphotericin B indicated a better level of evidence for the treatment of this infection with less toxicity and shorter treatment time.[25-26]

In a systematic study, it was observed that in most reviewed studies, children under five years of age (especially under one year) and adults over 40 years are more prone to have a clinical course leading to death.[27] It is noteworthy that the education of the subjects most vulnerable to leishmaniasis can be a tool for health promotion in order to develop the strategies for prevention of the disease, based on the articulation between health services, with a view to contributing to the most appropriate clinical conduct possible.

The numbers and percentages of blank and ignored draw attention, the limited quality of records of Health Information Systems generates discussions and compromises the identification of the real magnitude of the problem and often produces inconsistences hindering the production of epidemiological studies on population health problems.[28]

The early detection of leishmaniasis cases is characterized as an auspicious measure to a change of this overview in Brazil. Until 2014, the detection of this infection occurred through serological indirect fluorescent antibody tests (IFAT) for human leishmaniasis and Kalazar Detect test; nevertheless, because it needs a laboratory structure to proceed with the diagnostic confirmation steps, these tests were still an obstacle within the primary health care. In 2015, IT LEISH rapid test arose, it has a differentiated dynamic since it has high specificity and sensibility and can be performed in blood collected in patient's finger with diagnosis available in 30 minutes.[29]

Strengthening the pillars of Unified Health System is important so that an effective reduction in the number of new cases can be achieved in the country in addition to making seroepidemiological surveys and parasite control. The following are pressing: to strengthen the link with the community and to facilitate access of patients with VL, to encourage health education and community participation in control actions. Basic sanitation should also be considered.[30]

STUDY LIMITATIONS

The study in question addresses a current and relevant problem from the point of view of public health; however, the study outline constitutes an important limitation since it precludes the investigation of associations between variables and cause and effect relationships.

CONTRIBUTIONS TO STRENGTHENING PUBLIC POLICIES

The identification of the current overview of visceral leishmaniasis infection and the main outcomes associated with this condition propose subsidy for health authorities create strategies to minimize and perhaps eliminate incidence, and death cases. To Understanding the behavior of a certain disease, how the transmission pattern occurs and how it affects the society favors to list prevention strategies and reduce the morbimortality percentages.

CONCLUSION

Visceral leishmaniasis remains neglected in Brazil, the study performed allowed us to infer relevant information for Piauí population with reference to visceral leishmaniasis cases as the results indicate endemic occurrence of the disease in the State.

In the results obtained, peaks of increase in the number of reported cases over the period are indicated. Also, the predominance of emergence of cases in specific groups was observed, such as males, age group under 9 years, lower levels of education.

Therefore, a more effective disease control in the state is necessary, focusing on early identification of cases, investment in population education to attenuate the transmission through the control of reservoirs and vectors and thus reduce the number of cases of the disease in the state. In this way, the following are recommended: preventive actions directed at target audience in priority areas and the capacitation of health professionals to report, diagnose and treat the disease.

Moreover, the reduction in VL cases in the State requires joint efforts of various departments that comprehend from scientific knowledge areas added to public health services in state, city, region and local levels, aiming to improve the effectiveness of VL surveillance and control actions. In this context, health professionals, especially nurses, should be active and permanently into the dynamic, complex and proactive process of control actions of

this disease (zoonosis), seeking to instruct the population on the disease transmission and prevention through lecture or even distribution of leaflets, warning about the risks of this disease and giving instructions on its treatment.

RESUMO

Introdução: A leishmaniose visceral (LV) é uma doença infecciosa podendo ocasionar quadros de letalidade ao homem na ausência de tratamento oportuno. O objetivo do estudo é descrever o perfil epidemiológico da Leishmaniose Visceral humana em um estado do nordeste do Brasil. **Delineamento:** Estudo descritivo epidemiológico realizado por meio de levantamento no Sistema de Informação de Agravos de Notificação. Os dados foram coletados em outubro de 2019, referentes aos anos de 2008 a 2018 (n=2573). Calculou-se o coeficiente de incidência, e fizeram-se análises descritivas das variáveis sociodemográficas e clínicas dos casos. **Resultados:** Foram notificados 2573 casos de leishmaniose visceral em 10 anos no Estado do Piauí, sendo a maior incidência detectada em 2014 (9,89%), sexo masculino. Quanto à situação de encerramento, verificou-se taxa de cura de 52,35%, destaca-se a alta taxa de óbito (6,49%). **Implicações:** O Piauí segue endêmico no Brasil, faz-se necessário execução de ações mais efetivas no combate, com enfoque na identificação precoce dos casos, investimento na educação da população para atenuar a transmissão e assim reduzir o número de casos da doença no Estado.

DESCRITORES

Epidemiologia; Zoonoses; Leishmaniose Visceral.

RESUMEN

Introducción: La leishmaniasis visceral (LV) es una enfermedad infecciosa que puede causar casos de letalidad en los hombres en ausencia de un tratamiento oportuno. El objetivo del estudio es describir el perfil epidemiológico de la leishmaniasis visceral humana en un estado del noreste de Brasil. **Delineación:** Estudio epidemiológico descriptivo realizado a través de una encuesta en el Sistema de Información de Enfermedades de Notificación. Los datos se recopilaron en octubre de 2019, en referencia a los años 2008 a 2018 (n=2573). Se calculó el coeficiente de incidencia y se realizaron análisis descriptivos de las variables sociodemográficas y clínicas de los casos. **Resultados:** Se notificaron 2573 casos de leishmaniasis visceral en 10 años en el estado de Piauí, la mayor incidencia se detectó en 2014 (9,89%), en el sexo masculino. En cuanto a la situación de cierre, hubo una tasa de curación del 52,35%, con una alta tasa de mortalidad (6,49%). **Implicaciones:** Piauí sigue siendo endémico en Brasil, es necesario llevar a cabo acciones más efectivas en la lucha, centrándose en la identificación temprana de casos, la inversión en educación de la población para mitigar la transmisión y así reducir el número de casos de la enfermedad en el Estado.

DESCRIPTORES

Epidemiología; Zoonosis; Leishmaniasis Visceral.

REFERENCES

1. WHO. Organização Mundial de Saúde. Weekly epidemiological record: Global leishmaniasis update, 2006–2015: a turning point in leishmaniasis surveillance. Geneva: WHO; 2017. Available from: http://apps.who.int/iris/bitstream/10665/258973/1/WER9238.pdf

2. PAHO/WHO. Pan American Health Organization. Leishmaniasis Epidemiological Report of the Americas. Leishmaniasis report # 7 - March, 2019. Geneva: WHO; 2019. Available from: http://iris.paho.org/xmlui/bitstream/handle/123456789/50505/Leishreport2019_eng.pdf?sequence=9&isAllowed=y

3. Rodrigues ACM, Melo ACFL, Júnior Antônio DS, Franco SO, Rondon FCM, Bevilaqua CML et al. Epidemiologia da leishmaniose visceral no município de Fortaleza, Ceará. Pesq. Vet. Bras [Internet]. 2017 [cited 2019 Sep 20]; 37(10):1119–1124. Available from: https://doi.org/10.1590/s0100-736x2017001000013

4. Santos GM, Barreto MTS, Monteiro MJSD, Silva RVS, Jesus RLR, Silva HJN. Aspectos epidemiológicos e clínicos da leishmaniose visceral no estado do Piauí, Brasil. FAINOR [Internet]. 2017 Aug [cited 2020 Mar 23]; 10(2):142–153. Available from: http://srv02.fainor.com.br/revista/index.php/memorias/article/view/655/334

5. Brasil. Ministério da Saúde. Manual de vigilância, prevenção e controle de zoonoses: normas técnicas e ocupadas. 1. ed. Brasília: Ministério da Saúde; 2016. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/manual_vigilancia_prevencao_controle_zoonoses.pdf

6. Lemos MDA, Sousa OH, Silva ZSSB. Perfil da leishmaniose visceral no brasil: uma revisão bibliográfica. J Business Techn [Internet]. 2019 Feb [cited 2019 Sep 20]; 9(1):93. Available from: http://revistas.faculdadefacit.edu.br/index.php/JNT/article/view/399/328

7. Silva LB, Aquino DMC, Bezerra JMT, Melo MN, Leonardo FS, Silva ASG, et al. Fatores associados à leishmaniose visceral na área endêmica de Codó, estado do Maranhão, Brasil. R Epidemiol Control Infec [Internet]. 2016 Apr [cited 2019 Sep 20]; 6(2):74–80. Available from: https://doi.org/10.17058/reci.v6i2.6419

8. Araújo, DC. Análise espacial dos casos humanos de leishmaniose visceral. Arq Ciênc Saúde [Internet]. 2017 Apr [cited 2019 Sep 20]; 24(2):71–75. Available from: https://doi.org/10.17696/2318-3691.24.2.2017.683

9. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Guia de Vigilância e, Saúde: volume único [recurso eletrônico]. 2. ed. Brasília (DF): Ministério da Saúde; 2017. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/guia_vigilancia_saude_3ed.pdf

10. IBGE. Instituto Brasileiro de Geografia e Estatística. 2019. Available from: https://cidades.ibge.gov.br/brasil/pi/panorama

11. Brasil. Conselho Nacional de Saúde. Resolução 510/2016. Trata de pesquisas em seres humanos e atualiza a resolução 196. Diário Oficial da União, Brasília, DF, 12 dez. 2012. Available from: http://bvsms.saude.gov.br/bvs/saudelegis/cns/2016/res0510_07_04_2016.html

12. Oliveira EN, Pimenta AM. Perfil epidemiológico da leishmaniose visceral no município de Paracatu, MG no período de 2007 a 2010. REME [Internet]. 2014 Jan [cited 2019 Sep 20]; 18 (2):365–75. Available from: http://www.reme.org.br/artigo/detalhes/933

13. Alebie G, Worku A, Yohannes S, Urga B, Hailu A, Tadesse D. Epidemiology of visceral leishmaniasis in Shebelle Zone of Somali Region, eastern Ethiopia. Parasites Vectors [Internet]. 2019 Aug [cited 2019 Sep 20]; 12:209–213. Available from: https://doi.org/10.1186/s13071-019-3452-5

14. Amanati, A. Leishmaniose visceral: uma atualização e revisão da literatura, Arch Pediatr Infect Dis [Internet]. 2016 Aug [cited 2019 Sep 20]; 4(3):1–13. Available from: http://pedinfect.com/en/index.html

15. Cardim MFM, Guirado MM, Dibo MR, Chiaravalloti Neto F. Leishmaniose visceral no estado de São Paulo, Brasil: análise espacial e espaço-temporal. Rev Saude Publica [Internet]. 2016 Jul [cited 2019 Sep 20]; 50:48–60. Available from: http://www.scielo.br/pdf/rsp/v50/pt_0034-8910-rsp-S1518-87872016050005965.pdf

16. Sousa NA, Linhares CB, Pires FGB, Teixeira TC, Lima JS, Nascimento MLO. Perfil epidemiológico dos casos de leishmaniose visceral em Sobral-CE de 2011 a 2015. SANARE [Internet]. 2018 Sep [cited 2019 Sep 20]; 17(1):51–57. Available from: https://sanare.emnuvens.com.br/sanare/article/view/1222

17. Lima MES, Nascimento CEC, Ericeira AJP, Silva, FJLA. Perfil epidemiológico de crianças internadas com leishmaniose visceral em um Hospital Universitário do Maranhão. Rev Soc Bras Enferm Ped [Internet]. 2018 Jan [cited 2019 Sep 20]; 18(1):15–20. Available from: https://sobep.org.br/revista/images/stories/pdf-revista/vol18-n1/vol_18_n_1-artigo_original_2.pdf

18. Barbosa IR, Costa ICC. Aspectos clínicos e epidemiológicos da leishmaniose visceral em menores de 15 anos no estado do Rio Grande do Norte, Brasil. Scientia Médica [Internet]. 2013 Sep [cited 2019 Sep 20]; 23(1):5–11. Available from: https://doi.org/10.15448/1980-6108.2013.1.12970

19. Oliveira LB, Queiroz AAFLN, Sousa ÁFL, Araújo TME, Moura MEB, Reis RK. Epidemiologia do HIV/Aids em idosos de um estado do nordeste do Brasil: série histórica de 2007 a 2015. Evidentia [Internet]. 2017 Oct [cited 2019 Sep 20]; 1(14):1–10. Available from: http://www.index-f.com/evidentia/v14/e11025p.php

20. Maia HAAS, Alvaia MA, Silva IBD, Bessa Júnior J. Perfil epidemiológico dos casos de leishmaniose visceral em feira de Santana, Bahia, no período de 2001 a 2015. Rev Saúde Col UEFS [Internet]. 2018 Nov [cited 2019 Sep 20]; 8:70–74. Available from: http://periodicos.uefs.br/index.php/saudecoletiva/article/view/2749

21. Borges BKA, Silva, JA, Haddad JPA, Moreira ÉC, Magalhães DF, Ribeiro LML, Fiúza VOP. Avaliação do nível de conhecimento e de atitudes preventivas da população sobre a leishmaniose visceral em Belo Horizonte, Minas Gerais, Brasil. Cad Saúde Pública [Internet]. 2008 Jan [cited 2019 Sep 20]; 24(4):777–784. Available from: http://www.scielo.br/scielo.php?pid=S0102-311X2008000400007&script=sci_abstract&tlng=pt

22. Martins CP, Brandão MGSA, Braga MM, Sampaio LBF, Barros LM, Pacheco JCB. Monitoramento epidemiológico como instrumento de apoio à gestão de saúde: análise das notificações de leishmaniose visceral em Sobral, Ceará. Rev Adm Saúde [Internet] 2018 Jan [cited 2019 Sep 20]; 18(72):1–12. Available from: http://dx.doi.org/10.23973/ras.72.11

23. Sena, IVO, Werneck GL. Risk factors for in-hospital mortality from visceral leishmaniasis: A case-control study. J Infect Public Health [Internet]. 2019 Feb [cited 2019 Sep 20]; 1876-034: (19)30318–1. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1876034119303181

24. Sousa EP, Freitas AJS, Paz FAN, Oliveira EH. Evolução da leishmaniose visceral em São Luís, Maranhão: uma análise epidemiológica e temporal dos casos. Research, Society and Development [Internet]. 2020 Nov [cited 2019 Sep 20; 9(2):1–12. Available from: http://dx.doi.org/10.33448/rsd-v9i2.2197

25. Belo VS, Struchiner CJ, Barbosa DS, Nascimento BW, Horta MA, Silva ES, et al. Fatores de risco para prognóstico adverso e morte na leishmaniose visceral americana: uma metanálise. PLoS Negl Trop Dis [Internet]. 2014 Jan [cited 2019 Sep 20]; 8(7):1–13. Available from: https://www.arca.fiocruz.br/bitstream/icict/14051/1/8.pdf

26. Romero GAS, Costa DL, Costa CHN, Almeida RP, Melo EV, Carvalho SFG, et al. Efficacy and safety of available treatments for visceral leishmaniasis in Brazil: A multicenter, randomized, open label trial. PLoS Negl Trop Dis [Internet]. 2017 [cited 2019 Sep 20]; 11(6):1–12. Available from: https://doi.org/10.1371/journal. pntd.0005706

27. Belo VS, Werneck GL, Barbosa DS, Simões TC, Nascimento BWL, da Silva ES, et al. Correction: factors associated with visceral Leishmaniasis in the Americas: a systematic review and meta-analysis. PLoS Neglected Tropical Diseases [Internet]. 2014 Jul [cited 2019 Sep 20]; 7(4):2182–2193. Available from: https://doi.org/10.1371/annotation/83856044-8747-4d93-9a1e-64f16bb60c07

28. Toledo CRS, Almeida AS, Chaves SAM, Sabroza PC, Toledo LM, Caldas JP. Vulnerabilidade à transmissão da leishmaniose visceral Humana em área Urbana brasileira. Rev Saúde Pública [Internet]. 2017 Aug [cited 2019 Sep 20]; 51(49):1–11. Available from: http://www.scielo.br/pdf/rsp/v51/pt_0034-8910-rspS1518-87872017051006532.pd

29. Assis TSM, Azeredo-da-Silva ALF, Oliveira D, Cota G, Werneck GL, Rabello A. Cad Saúde Pública [Internet]. 2017 Jan [cited 2019 Sep 20]; 33(12):1–12. Available from: https://doi.org/10.1590/0102-311X00142416

30. Werneck GL. Controle da leishmaniose visceral no Brasil: o fim de um ciclo? Cad Saúde Pública [Internet]. 2016 Sep [cited 2019 Sep 20]; 32(6):1–16. Available from: http://www.scielo.br/pdf/csp/v32n6/1678-4464-csp-32-06-eED010616.pdf

COLLABORATIONS

JOS, KAAS, IVOS, LBO, LBO, AFAR e TMEA: Substantial contributions to work conception; to data collecting, analysis and interpretation; to writing the article or to its critical review; and to the final version to be published. All the authors agree and take responsibility for the content of this manuscript version to be published.

ACKNOWLEDGMENTS

Does not apply.

AVAILABILITY OF DATA

Does not apply.

FUDING SOURCE

Does not apply.

CONFLICTS OF INTEREST

There are no conflicts of interest to declare.