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ORIGINAL ARTICLE

Epidemiological aspects of an endemic area for visceral Leishmaniasis in a municipality in Maranhão, Brazil

Aspectos epidemiológicos de uma área endêmica para Leishmaniose visceral em um município do Maranhão, Brasil

Aspectos epidemiológicos de un área endémica de leishmaniasis visceral en un municipio de Maranhão, Brasil

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ABSTRACT

Justification and Objectives: Visceral Leishmaniasis (VL) is considered one of the six major priority endemic diseases and of great concern for public health due to its lethality and high incidence. This study aims to describe the socioeconomic, demographic and environmental characteristics of families living in the area with the highest number of cases of VL reported in the municipality of Itapecuru Mirim, Maranhão. **Methods:** this is a cross-sectional descriptive study. The study included 273 families in the area with the highest number of cases. **Results:** it was found that the majority of homes were masonry and covered with tile. The houses had four to six inhabitants who lived on an income below the minimum wage. The services of piped water, waste collection and the presence of septic tank were mentioned by 68.13% of the interviewees. Animal breeding and the presence of animals close to the interviewees' homes was mentioned. VL cases were reported in the family and in the neighborhood. Most respondents were unaware of carrying out control actions for the reservoir and VL vector in the municipality (93.64%). Among families with a history of VL, 56.25% reported that they were not followed up during treatment. **Conclusion:** the study contributes to understanding the dynamics of infection by VL in the population of the neighborhood, stimulating further studies that encompass the entire municipality or the state. Thus, the data collected serves to alert health managers in the municipality about the problems identified.

Descriptors: *Visceral leishmaniasis. Epidemiology. Socioeconomic conditions.*

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RESUMO

Justificativa e Objetivos: A Leishmaniose Visceral (LV) é considerada uma das seis principais doenças endêmicas prioritárias e de grande preocupação para a saúde pública devido à sua letalidade e elevada incidência. Este estudo tem como objetivo descrever as características socioeconômicas, demográficas e ambientais das famílias residentes na área com maior número de casos de LV notificados no município de Itapecuru Mirim, Maranhão. **Métodos:** trata-se de um estudo descritivo transversal. O estudo incluiu 273 famílias da área com maior número de casos. **Resultados:** constatou-se que a maioria das residências era de alvenaria e revestida com telha. As casas possuíam de quatro a seis habitantes que viviam com uma renda inferior a um salário mínimo. Os serviços de água encanada, coleta de lixo e presença de fossa séptica foram citados por 68,13% dos entrevistados. A criação de animais e a presença de animais próximos às residências dos entrevistados foi mencionada. Os casos de LV foram notificados na família e na vizinhança. A maioria dos respondentes desconhecia a realização de ações de controle do reservatório e vetor de LV no município (93,64%). Entre as famílias com história de LV, 56,25% relataram que não foram acompanhadas durante o tratamento. **Conclusão:** o estudo contribui para a compreensão da dinâmica da infecção por LV na população do bairro, estimulando a realização de novos estudos que englobem todo o município ou estado. Assim, os dados coletados servem para alertar os gestores de saúde do município sobre os problemas identificados.

Descritores: *Leishmaniose visceral. Epidemiologia. Condições socioeconômicas.*

RESUMEN

Justificación y objetivos: La leishmaniasis visceral (LV) se considera una de las seis enfermedades endémicas prioritarias y de gran preocupación para la salud pública por su letalidad y alta incidencia. Este estudio tiene como objetivo describir las características socioeconómicas, demográficas y ambientales de las familias que viven en el área con mayor número de casos de LV reportados en el municipio de Itapecuru Mirim, Maranhão. **Métodos:** se trata de un estudio descriptivo transversal. El estudio incluyó a 273 familias de la zona con mayor número de casos. **Resultados:** se encontró que la mayoría de las viviendas eran de mampostería y revestidas con teja. Las casas tenían de cuatro a seis habitantes que vivían con ingresos inferiores al salario mínimo. Los servicios de agua corriente, recolección de residuos y presencia de fosa séptica fueron mencionados por el 68,13% de los entrevistados. Se mencionó la cría de animales y la presencia de animales cerca de los hogares de los entrevistados. Se informaron casos de LV en la familia y en el vecindario. La mayoría de los encuestados desconocía realizar acciones de control del embalse y vector VL en el municipio (93,64%). Entre las familias con antecedentes de LV, el 56,25% informó que no se les dio seguimiento durante el tratamiento. **Conclusión:** el estudio contribuye a comprender la dinámica de infección por LV en la población del barrio, estimulando nuevos estudios que abarquen todo el municipio o el estado. Así, los datos recolectados sirven para alertar a los gerentes de salud del municipio sobre los problemas identificados.

Descriptores: *Leishmaniasis visceral. Epidemiología. Condiciones socioeconómicas.*

INTRODUCTION

Visceral Leishmaniasis (VL) is considered an endemic disease of great concern for public health due to its lethality and high incidence.[1] It is one of the main vector-borne diseases in the world, presenting a wide geographical distribution. It is classified as a neglected tropical climatic disease that can present acute, subacute or chronic evolution. In Brazil, according to notification data from the Notifiable Diseases Information System (SINAN - *Sistema de Informação de Agravos de Notificações*) from 2001 to 2014, 47,859 new cases of VL were reported with a mean incidence rate of 1.8 per 100,000 inhabitants.[1]

According to a study promoted by members of the World Health Organization in 2012, more than 90% of global cases of VL occur in only a few countries: India, Bangladesh, Sudan, South Sudan, Brazil, and Ethiopia. Neglected disease previously considered to be exclusive to the wild, it now expands to peri-urban and urban areas. It has been observed, in recent decades, that such changes are associated with the constant changes in the behavior of society.[2] Among the factors that contributed to these changes, there is the migration of men from rural areas to the periphery of cities, where they start to live with low socioeconomic conditions and in precarious housing and sanitation conditions, forming densely populated clusters, where it is possible to detect environmental destruction and unplanned land occupation. [3]

In these areas, contact with domestic animals is common, a fact that results in the accumulation of organic matter, producing favorable conditions for the transmission of VL. Some authors associate VL with malnutrition. VL was given a characteristic of neglected disease in neglected populations due to the local and social characteristics where the cases predominate.[4,5]

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VL is caused by protozoa of the genus *Leishmania*, especially by the species *Leishmania chagasi* in Brazil. The vectors that transmit the parasite are sandflies, and in Brazil, the species *Lutzomyia longipalpis* is the main species. Transmission occurs through the female's bite as long as there is parasitism of the skin or in the host's peripheral blood. In cities, the vector's domiciliation can be stimulated by factors such as human and animal food source supply, by afforestation in backyards, waste accumulation, presence of wild animals in the urban perimeter and discontinuity of the entomology service.[5,6]

For the transmission to occur, it is also necessary to insert a susceptible host/reservoir. (*Canis lupus familiaris*) dogs are identified as the main domestic reservoir.[6,7] It should be noted that VL control is the responsibility of the Brazilian Unified Health System (*Sistema Único de Saúde*), and aims to decrease disease transmission levels and reduce the lethality rate. The control measures are the detection and treatment of human cases, vector control, the elimination of reservoirs and health education.[1,5,8]

In the municipality of Itapecuru Mirim, state of Maranhão, Brazil, between 2008 and 2012, 80 cases of VL were recorded, with a mean of 16 cases per year. In addition to this data, a study carried out in 2015, covering the period from 2000 to 2009 in the municipalities of Maranhão, revealed that Itapecuru Mirim presented an incidence rate corresponding to 5.5/100,000 inhabitants, being classified by the Ministry of Health (MoH) as municipality of intense disease transmission. It should be noted that the Torre neighborhood, which belongs to the urban area of the city, concentrated 25% of the total cases.[9,10]

Therefore, in order to understand the current importance of studying the epidemiological characteristics of VL in Itapecuru Mirim, a great effort is needed to understand the dynamics of transmission, as well as the population groups at greatest risk for the disease. Among the localities in the municipality, the Torre neighborhood was chosen because it had the highest number of notifications according to the Municipal Department of Health (MDH). This study aimed to describe the socioeconomic, demographic and environmental characteristics of families living in the area with the highest number of cases of VL reported in the municipality of Itapecuru Mirim, Maranhão.

METHODS

A descriptive study with a quantitative approach was carried out in the municipality of Itapecuru Mirim-Maranhão, Brazil. The municipality has 68,203 inhabitants according to the 2019 sense of the Brazilian Institute of Geography and Statistics (IBGE - *Instituto Brasileiro de Geografia e Estatística*), 30.7% of adequate sanitation, 3.1% of urbanization of public roads, with a predominant *Cerrado* biome (similar to the savannas) and Amazon.

To design the study, the area to be studied was initially selected, based on the largest number of VL cases notified and registered by SINAN, selecting the Torre neighborhood. From the identification of the neighborhood with the highest number of cases of VL, a search was made of the total number of families living in the neighborhood to proceed with the calculation of the study sample.

To calculate the sample, the StatCalc of the EpiInfo Program, version 7 of the Centers for Disease Control and Prevention (CDC) of Atlanta, was used, based on a population size of 838 families, expected frequency of 50%, confidence level equal to 95% and a minimum error of 5%. After the calculation, the sample was defined in 274 families.

The choice of participants was made by lot, where each family resident in the endemic neighborhood received an identification number. The first number was drawn from the range of one to three (838 divided by 274=3.1); the other numbers were selected considering the initial number drawn plus the interval of three. The first number was one, the remaining four, seven, ten and so on.

After the draw, the selected families received a visit from the interviewer to apply the form in order to survey the socioeconomic and environmental characteristics (characteristics of the residence, number of people living in the house, family income, origin of the water used for drinking, destination of the waste, destination of wastes, breeding of domestic animals, presence and type of animals near the residence, presence of pigsty and hen near the residence, presence of sandflies inside/outside the residence, presence of accumulated waste and woods near the residence, cases of VL in the family, degree of kinship of VL cases in the family and VL cases in the neighborhood) and the control actions carried out for the disease (sandfly capture service performed by MDH, type of trap used for sandfly capture, spray service, clinical examination and collection of material for laboratory examination of the dog, euthanasia of the VL-infected dog, accompaniment that of MDH of positive cases of leishmaniasis, guidelines for the prevention of leishmaniasis, monitoring of leishmaniasis treatment). During home visits, participants were informed about the research objective and received a subsequent invitation to participate in the study.

A non-validated questionnaire built by the researchers was used to collect the data. The questions were answered by the head of each family. Of the 274 households drawn, only one household refused to participate, and the final sample of the survey consisted of 273 households. During the interviews, figures of sandflies were shown, as well as the traps used to capture it, facilitating the recognition of both.

For analysis, the data were processed using the IBM® SPSS® software, version 23.0. Descriptive statistics were calculated, such as mean, standard deviation and frequencies. In the inferential analysis, for quantitative independent variables, the normality of the data was verified using the Kolmogorov-Smirnov test, and the Student t test was performed. For the qualitative independent variables, Pearson's chi-square test was performed, and when the assumptions of this test were not met, Fisher's exact test was used. The frequencies of the contingency table were calculated in the rows, and the results were compared in the columns. For significant associations,

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the prevalence ratio (PR) and the respective confidence interval (95% CI) were presented. All analyzes were performed at a 5% significance level.

This study was approved by the Research Ethics Committee of the University Hospital of *Universidade Federal do Maranhão*, under Opinion 537.125 and CAAE (*Certificado de Apresentação para Apreciação Ética* - Certificate of Presentation for Ethical Consideration) 24996913.0.0000.5086. Those responsible for the families were approached at home and informed about the study; those who agreed to participate signed the Informed Consent Form. The consent of MDH from Itapecuru Mirim was also obtained, given by letter of authorization. The ethical principles of research involving human beings established in Resolution CNS (*Conselho Nacional de Saúde* - Brazilian National Health Council)/MoH 466/12 were obeyed.

RESULTS

Through descriptive data analysi, it was observed in the sociodemographic characterization that the families and houses visited had a mean of 53.5% (n=146) of income below 1 minimum wage (MW); 82.4% (n=225) lived in a masonry house; 96.7% (n=264) lived in houses covered by tile; the source of the water used for drinking in 99.3% (n=271) came from the public network; the destination of the waste in 79.5% (n=217) was through public collection; waste was poured into a septic tank in 68.1% (n=186) of the cases (Table 1).

As shown in table 2, chicken coops and pig pens were found close to 34.8% (n=95) and 21.6% (n=59) of the households visited, respectively. A large part of the interviewees (83.5%, n=228) reported not having accumulated waste close to their home. The presence of woods close to the dwellings was reported by 30.0% (n=82) of residents, and the presence of sandflies was confirmed by 2.6% (n=7) of residents. Raising domestic animals occurred in 57.1% (n=156) of the households. Regarding cases of VL in the family, 10.3% (n=28) reported having and 30.0% (n=82) said they had positive cases in the neighborhood.

In households that used cesspit as a destination for waste, the prevalence of cases of VL in the family was approximately 2.4 times higher compared to those that did not use it (PR=2.374; 95% CI=1.188-4.746). The existence of woods in a place close to the residence was also related to the presence of VL in the family (p=0.015), with a prevalence 2.3 times higher in relation to places without woods (PR=2.329; 95% CI=1.163-4.663).

Considering the 245 cases in the neighborhood with registered evaluation, there was a statistically significant difference in the number of residents (p=0.005), in which houses with cases of VL had a greater number of people. Neighborhoods with masonry houses showed 38.4% lower frequency of VL cases (PR=0.616; 95% CI=0.416-0.912) compared to other types of construction (p=0.028), while neighborhoods with adobe houses showed prevalence 62.3% higher in cases of VL (PR=1.623;

Table 1. Socioeconomic data of the families and houses visited (n=273). Itapecuru Mirim, Maranhão, Brazil 2014.

Variable	M	SD	n	%
Number of residents per household	4.2	1.8		
Family income				
Less than 1 MW			146	53.5
1 to 3 MW			126	46.2
Not reported			1	0.4
Type of house wall				
Masonry			225	82.4
Adobe			45	16.5
Masonry and adobe			1	0.4
Straw			1	0.4
Adobe			1	0.4
Type of housing coverage				
Tile			264	96.7
Straw			8	2.9
Tile and straw			1	0.4
Origin of the water used for drinking				
Public network			271	99.3
Well			2	0.7
Waste destination				
Public collection			217	79.5
Burned and buried			41	15.0
Open sewage			8	2.9
Buried			1	0.4
Public collection and burned			3	1.1
Open sewage and burnt			3	1.1
Destination of waste				
Sewage network			12	4.4
Septic tank			186	68.1
Cesspit			73	26.7
Ditch			1	0.4
Woods			1	0.4
Total			273	100

Caption: M: mean; SD: standard deviation.

Table 2. Epidemiological and environmental data of the families and homes visited (n=273). Itapecuru Mirim, Maranhão, Brazil, 2014.

Variable	n	%
Chicken coop near the house		
Yes	95	34.8
No	178	65.2
Chicken coop near the house		
Yes	59	21.6
No	214	78.4
Waste accumulated near the house		
Yes	45	16.5
No	228	83.5
Woods near the house		
Yes	82	30.0
No	191	70.0
Sandflies inside/outside the house		
Yes	7	2.6
No	266	97.4
Raising animals in the house		
Yes	156	57.1
No	117	42.9

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Presence of animals near the house		
Yes	230	84.2
No	43	15.8
VL cases in the family		
Yes	28	10.3
No	245	89.7
VL cases in the neighborhood		
Yes	82	30.0
No	163	59.7
Ignored/not informed	28	10.3
Total	273	100.0

Table 4. Control actions for VL carried out in the endemic area (n=273). Itapecuru Mirim, Maranhão, Brazil.

Variable	n	%
Sandfly capture		
Yes	6	2.2
No	267	97.8
Spraying		
Yes	21	7.7
No	252	92.3
Examination of the dog		
Yes	9	3.3
No	264	96.7
Visit during treatment		
Yes	31	11.4
No	242	88.6
Professional who made the visit (n=31)*		
Community health worker	31	11.4
Nurse	2	0.7
Endemic agent	1	0.4
Total	273	100.0

Caption:: frequencies in the "yes" category only.*

95% CI=1.096-2.403) in relation to the others (p=0.028). Using septic tanks represented a 68.0% lower prevalence of cases of VL in the neighborhood (PR=0.680; 95% CI=0.478-0.967) (Table 3).

Table 4 reports that sandfly capture by MDH in the neighborhood or in the interviewees' home was reported by only six participants (2.2%, n=6). Spraying actions at home or in the neighborhood were unknown to 92.3% (n=252) of respondents. Of the total respondents, only 3.3% (n=9) said they had performed exam in the dog. During treatment, the visit occurred in 11.45 (n=31) of cases, and the professional who most visited the visit was the Community Health Worker (11.4%, n=31).

DISCUSSION

In this study, we sought to outline the sociodemographic characteristics of the residents of the municipality mentioned. Thus, it was observed that the majority of households had between four and six residents with a family income of less than one minimum wage (53.5%). These data are similar to those found in a study published in 2019, which refers to the epidemiological profile of notifications by VL in Maranhão, in which it corroborates that low per capita income is a risk factor for illness due to VL.[11]

Masonry walls (82.4%) and tile coverage (96.7%) are the variables most frequently found in the homes of the studied location. Such data diverge from national and international studies that state that families residing in places with inadequate structure, whose family members have a low level of education and a higher risk for infection by VL.[2,11,12]

Almost all households in the Torre neighborhood (99.3%) used water from the public network and 79.5%

Table 3. Socioeconomic, epidemiological and environmental variables related to the presence of VL in the family and in the neighborhood (n=273). Itapecuru Mirim, Maranhão, Brazil, 2014.

Variable	VL in the family			VL in the neighborhood		
	Yes	No	p	Yes	No	p
No. of residents per household*	4.5±2.0	4.2±1.8	0.283[t]	4.7±1.9	4.0±1.6	0.005[t]
House wall - masonry**						
Yes	23 (10.2)	203 (89.8)	1.000[f]	65 (30.8)	146 (69.2)	0.028[q]
No	5 (10.6)	42 (89.4)		17 (50.0)	17 (50.0)	
House wall - adobe**						
Yes	6 (13.0)	40 (87.0)	0.593[f]	17 (50.0)	17 (50.0)	0.028[q]
No	22 (9.7)	205 (90.3)		65 (30.8)	146 (69.2)	
Waste destination - septic tank**						
Yes	16 (8.6)	170 (91.4)	0.188[q]	52 (29.5)	124 (70.5)	0.038[q]
No	12 (13.8)	75 (86.2)		30 (43.5)	39 (56.5)	
Destination of waste - cesspit**						
Yes	13 (17.8)	60 (82.2)	0.013[q]	25 (42.4)	34 (57.6)	0.096[q]
No	15 (7.5)	185 (92.5)		57 (30.6)	129 (69.4)	
Woods near the house**						
Yes	14 (17.1)	68 (82.9)	0.015[q]	23 (34.3)	44 (65.7)	0.861[q]
No	14 (7.3)	177 (92.7)		59 (33.1)	119 (66.9)	
Total	28 (10.3)	245 (89.7)		82 (33.5)	163 (66.5)	

*Caption: *: mean ± standard deviation; **: n (%); p: significance of the test; t: Student's t test ; q: Pearson's chi-square; f: Fisher's exact.*

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had public waste collection. Furthermore, the data show that 68.1% and 26.7% of houses had septic tank and cesspit, respectively. These findings contradict data observed in other locations, which point out the waste not collected by the public system and the inappropriate waste destination as a potential breeding ground for the vectors, which could lead to the maintenance of VL in endemic areas.[2,12,13]

The variable that corresponds to the presence of chicken coops, pigsties and woods was presented with a proportion close to 30% of the houses visited. Studies carried out in Altos (PI), Fortaleza (CE), Tocantins, Pará and Rio de Janeiro, in Brazil, showed the highest proportion of VL in areas with mean vegetation close to the houses.[14-16] The mean vegetation corresponds to the vegetation of stature and mean density in the stage of recovery of native woods, characterized by the presence of grasses, vines, flora from low to mean stature. Chicken coops and pig pens serve as food sources for the females of sandflies, and this contributes to increase the population density of the vector according to a study carried out in Belo Horizonte (MG). Furthermore, most interviewees (83.5%) reported not having waste accumulated near your residence. This data, when compared to national studies from other locations, points to this as a protective factor, while waste in wasteland is a common and relevant element in the epidemiology of VL in endemic areas.[14,17,18]

The presence of sandflies was confirmed only by 2.6% of residents, despite the fact that the analyzed area has a large number of cases of the disease. It is noteworthy that the variety of scenarios that favor transmission is an important epidemiological implication observed when discussing neglected diseases, such as VL, both nationally and worldwide. The non-confirmation of the presence of the vector in the area by the interviewees may suggest the lack of prior knowledge about it by the population. Moreover, the vector has a small size, with short and low flights and jumps close to the ground, making it difficult to visualize and identify them.[5,14,17]

Raising animals occurred in 57.1% of the households visited, and the presence of a dog close to homes was reported by most respondents. A greater risk for the disease is pointed out in homes that have dogs in an endemic area for VL, especially in those where the animals do not have veterinary monitoring. There are studies that claim that close contact with dogs is a risk factor for VL infection. Thus, raising animals and their presence close to homes can contribute to the maintenance of VL.[7,19-22]

Sandfly capture in the neighborhood or at the interviewees' homes was mentioned by only six participants and for most of them it occurred in the peridomicile, in the year prior to the present work, and the capture was carried out by MDH. Considering the municipality of Itapecuru Mirim as an area of intense transmission for VL and the Torre neighborhood as the largest place of occurrence of cases, entomological surveillance is fundamental to the knowledge of the vector dispersion, aiming at orientation of control actions. The low rate of confirmation of capture actions may also be associated with the population's lack of knowledge about the VL vector.[5,6,18,20]

To survey the actions taken by the municipality aiming to control the VL, interviews were conducted with the coordinators and those responsible for the sectors of primary care, health education, school health, zoonosis control and health surveillance. At the time, records and documents were requested to prove the interviewees' statements. It is noteworthy that, in some cases, the records were not found, and the actions were based only on the interviewees' statements. Interviews are narratives where various ways of telling the same fact are understood, being a way of revealing or subtracting from the truth. Therefore, data that has not been confirmed by official documents are subject to the influence of the interviewee. Records of entomological surveys were sent by a Regional Health Unit of Itapecuru.

Spraying actions at home or in the neighborhood were unknown to more than 90% of respondents, and when they are mentioned, they occurred three or more years ago. National studies corroborate that the application of residual insecticide reduces the density of sandflies and consequently the incidence of the disease.[24] The spraying actions are recommended by MoH for municipalities with intense transmission of VL whenever deemed necessary. Thus, according to the respondents' response, we perceive the scarcity of actions to combat the vector carried out by MDH.[23]

Of the residents who owned animals in the residence, only 3.3% (n=9) stated that their animal was ever examined. When the dog exam was positive for VL, the sacrifice took place at the zoonoses center or at home, performed by the resident. According to the Federal Council of Veterinary Medicine, this should not happen, whereas there are protocols for the sacrifice of animals without suffering and mistreatment. The sacrifice of serum reactive dogs is recommended by MoH as an efficient action in reducing VL in endemic areas. However, this measure is controversial in Brazil and in several countries. It should also be noted that the measure is not well received by the population, and, if euthanasia occurs, it must be carried out in accordance with the provisions of the Federal Council of Veterinary Medicine, without suffering to the animal.[24.25]

Approximately 10.3% (n=28) of families interviewed referred to the occurrence of cases of VL in their family; however, half said they had not been visited by any health worker during treatment. When the visit took place, it was mostly carried out by the Community Health Worker, and this, in turn, forwarded guidelines for preventing the disease in all the homes visited. According to MoH, Family Health Strategy must monitor VL cases, helping to integrate surveillance and assistance actions. When the patient is properly assisted, the risk for disease complications and treatment abandonment is reduced. Home visits are part of good educational practices, helping to prevent and control VL.[23]

Based on the analyzed data of the study referring to poor basic sanitation, low socioeconomic status, scarce knowledge about sandflies and ineffective prevention

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measures are examples of common characteristics that help to increase the proliferation of the vector. However, some variables such as masonry and tile houses differ from those found in national and international studies about housing characteristics that involve regions with a high incidence of VL.[23-25]

It is emphasized as limitations of the study that the data referring to the socioeconomic, demographic and environmental characteristics of the families living in the Torre neighborhood were obtained through interviews with the person responsible for the family, being subject to factors such as: inability or inability of the interviewee to respond adequately, interviewee's willingness to provide the necessary information, providing false answers or withholding important data for fear that the interviewee's identity will be revealed. Therefore, such data must be interpreted with caution for reproducibility purposes.

Despite the limitations, the study contributes to understanding the dynamics of VL infection in the population of the neighborhood, encouraging further studies that encompass the entire municipality or the state. Thus, the data collected serve to alert health managers in the municipality about the problems identified, in order to minimize or remedy them, through strategies and action plans aimed at prevention and health promotion for the population of the studied neighborhood.

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AUTHORS' CONTRIBUTIONS

Rafiza de Josiane Mendes do Lago and Dorlene Maria Cardoso de Aquino contributed to the conception, design of the article, analysis and writing of the article;

Isaura Danielli Borges de Sousa, Layana Pachêco de Araújo Albuquerque and Francyelle Costa Moraes contributed to the planning and design of the article, review and final approval of the article;

All authors have approved the final version to be published and are responsible for all aspects of the work, including ensuring its accuracy and integrity.

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