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**A TEN YEAR (1990-1999) SURVEY ON LEISHMANIASIS  
INCIDENCE IN PERNAMBUCO STATE,  
NORTHEASTERN BRAZIL**

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**ABSTRACT**

Diseases caused by *Leishmania* parasites are relatively common in rural areas in Brazil. However, studies on eco-epidemiological aspects of the disease and its vectors, *Lutzomyia* species (Diptera: Psychodidae), are scarce. We studied the leishmaniasis incidence from January 1990 to December 1999 in the State of Pernambuco, Northeastern Brazil. Based on data collected by the Fundação Nacional de Saúde, the profile of infected people, in terms of age, sex and occupation was investigated. The physiogeographical aspects of disease incidence were also considered. A total of 7,616 cases were recorded, of which 82.8% were cutaneous and 17.2% were visceral leishmaniasis. A higher incidence of disease was observed among men, and areas with remnants of rainforest had higher rates of infection. Children and early teenagers had a higher percentage of infection, as had adults involved in agricultural activities. Changes in vegetation composition and abundance, associated with an adaptative behavior by female mosquito vectors, may have contributed to an increase of leishmaniasis incidence in urban areas.

**KEYWORDS:** Epidemiology. Leishmaniasis. Disease prevalence. Sandflies. *Lutzomyia*.

**INTRODUCTION**

Leishmaniasis is probably the second most important disease caused by protozoan parasites in the world (Lainson & Shaw 1978). The high numbers of infected people have led the World Health Organization to rank it among the six most serious diseases in tropical countries (WHO 1990). Estimates from the WHO suggest that over 350 million people around the world are at risk of becoming infected, including a significant part of South American populations (WHO 1990; Taniguchi et al. 1991).

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In Brazil, leishmaniasis is relatively common throughout rural areas, infecting humans and other mammals, such as rodents, marsupials, primates, dogs and edentates (Gomes et al. 1986). The two main forms of the disease, the American visceral leishmaniasis (AVL) and the American cutaneous leishmaniasis (ACL) occur in Brazil, both transmitted by female phlebotomine sand flies from the genus *Lutzomyia* (Diptera: *Psychodidae*). ACL seems to be endemic to 17 of the 27 states in Brazil, especially in the countryside, although some peaks in the incidence may sporadically occur (Grimaldi et al. 1989). AVL also has a wide distribution, and is currently found in rural areas in all regions of Brazil (Taniguchi et al. 1991).

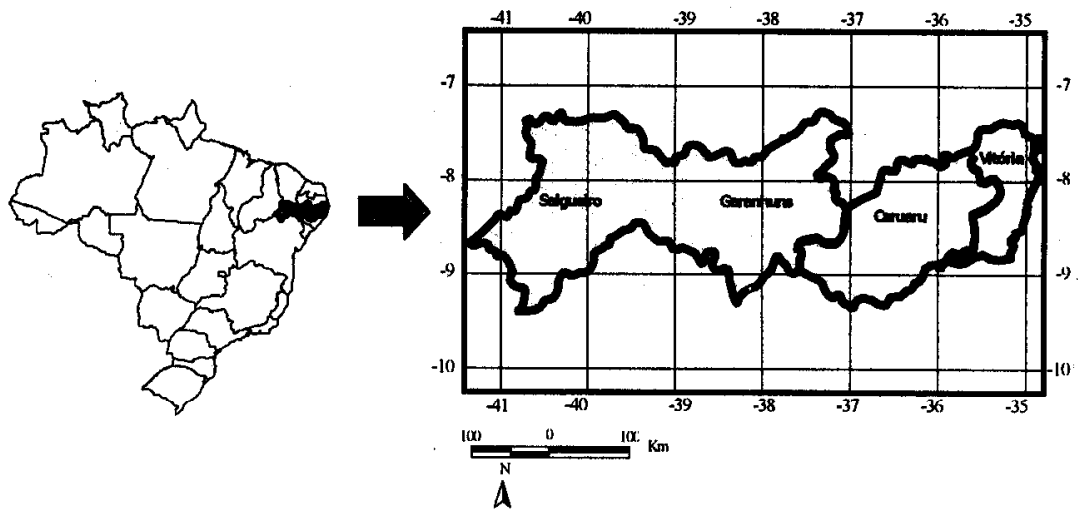
The Fundação Nacional de Saúde (National Health Foundation, referred to as FUNASA thereafter), a branch of the Ministry of Health, recorded 131,166 new cases of ACL and 12,345 new cases of AVL in the 1980's (Taniguchi et al. 1991). However, 28,843 new cases of leishmaniasis were reported in the period between 1990 and 1991, of which 27,374 occurred in the Northeast region of the country (Lacerda 1994). Recent studies have confirmed the increase in the incidence of leishmaniasis in Northeastern Brazil, especially in the State of Pernambuco, where it has become a major issue in public health (Brandão-Filho et al. 1994).

With several species of infective *Leishmania* parasites, various host and vector species, and a wide range of topographically diverse foci in the world, the ecology and epidemiology of leishmaniasis are probably the most complex of all vector-borne diseases (Lane 1993). As part of a study on the ecology of leishmaniasis vectors in Pernambuco, the objective of this survey was to examine the occurrence of leishmaniasis throughout the state. Besides registering the number of AVL and ACL cases, the sex, age and occupation of infected individuals were also analyzed.

## MATERIAL AND METHODS

The data used for this analysis were obtained from FUNASA, the agency responsible for the register, verification and monitoring of leishmaniasis cases in Brazil. This survey was based on medical files for leishmaniasis diagnosis and treatment containing information including the patient's name, age, sex, occupation, kind of lesions and recommended treatment. It was carried out in the State of Pernambuco from January 1990 to December 1999. For ethical reasons, the names of patients were not disclosed in any stage of the research.

The State of Pernambuco, with a population of about 7,5 million inhabitants, is located in Northeastern Brazil (34°88'11''W; 8°05'39''S) and has an area of 98,937 km<sup>2</sup>. Pernambuco has 177 municipalities, and in this survey only those with leishmaniasis cases were considered. For logistical reasons, FUNASA has divided the State into four main geographical regions where cases were registered (Figure 1).



*Figure 1.* Localization of the State of Pernambuco, Brazil, and the districts surveyed for the presence of leishmaniasis between 1990 and 1999

*Area I - Vitória District:* the 38 municipalities from this district in which leishmaniasis cases were recorded represent 11% of the State area, with a population of 2,093,607. This district consists mainly of what is called Zona da Mata, of which a great part was originally occupied by rainforest. It has a high population concentration in and around large cities, with agricultural areas in the outbound, especially sugarcane plantations. It is located in the lowlands of the Atlantic coast, has tropical climate, and average rainfall between 700 and 2,000 mm/year.

*Area II - Caruaru District* (28 municipalities with leishmaniasis cases): represents 19% of the area of the territory, with a population of 938,857. It is considered as a transition region between the humid, fertile Zona da Mata and the caatinga, a type of dry savannah. It consists mainly what is called Agreste, which has tropical sub-humid climate, and rainfall between 600 to 1,000 mm/year. In this area subsistence agricultural and livestock are the most important activities.

*Area III - Garanhuns District* (17 municipalities), with a population of 493,548, and *Area IV - Salgueiro District* (29 municipalities), with a population of 720,125. Although Garanhuns District has also climatological and geographical characteristics similar to the Agreste, both areas tend to be surveyed as a whole, due to similarities in physical geography and land occupation. Moving to the far west of the State, the areas are dominated by the caatinga located in the hottest area of Brazil, with scarce and irregular rainfall (< 600 mm/year).

## RESULTS

Between 1990 and 1999, 7,616 cases of leishmaniasis were recorded in the State of Pernambuco. Of these, 6,308 (82.8%) were American cutaneous leishmaniasis and 1,308 (17.2%) American visceral leishmaniasis (Figures 2 and 3). Two districts had the vast majority of ACL cases: Vitoria (with 50.2% of the cases) and Caruaru (44.8%) (Table 1). In terms of proportion of cases, the Caruaru District had the highest rate, with 241,5 cases/100,000 inhabitants while the lowest rate was registered in Garanhuns, with 16,9 cases/100,000 inhabitants.

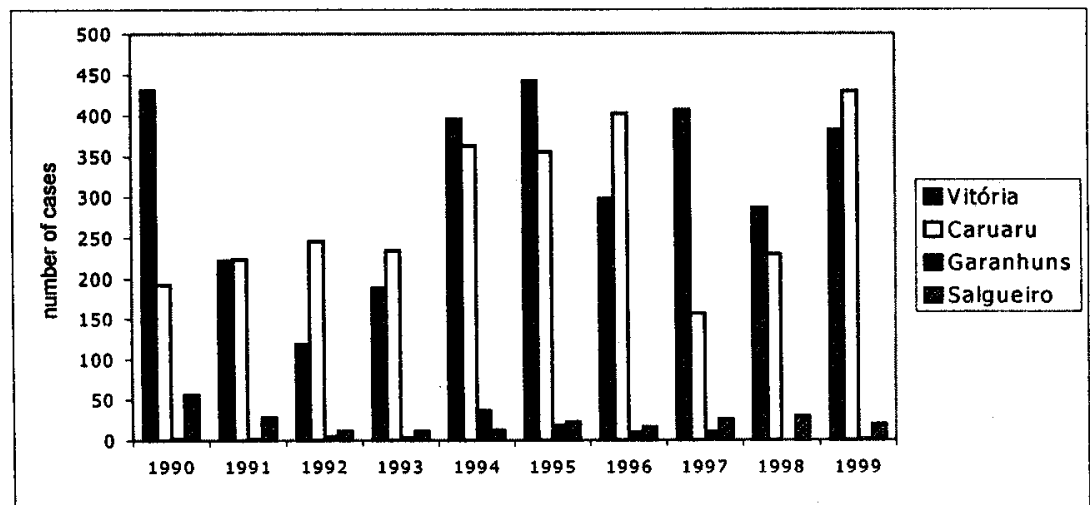


Figure 2. Number of American cutaneous leishmaniasis cases in each district of the State of Pernambuco, Brazil, between 1990 and 1999

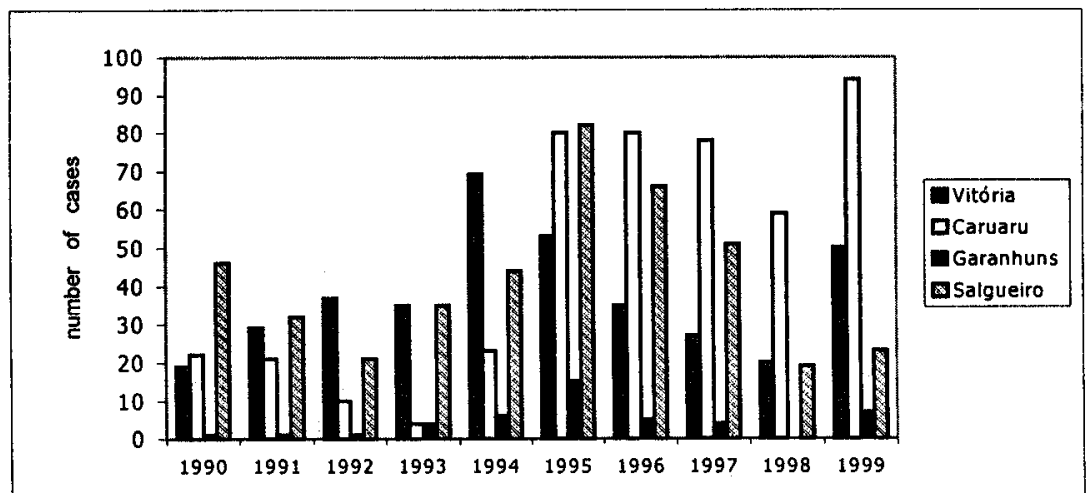
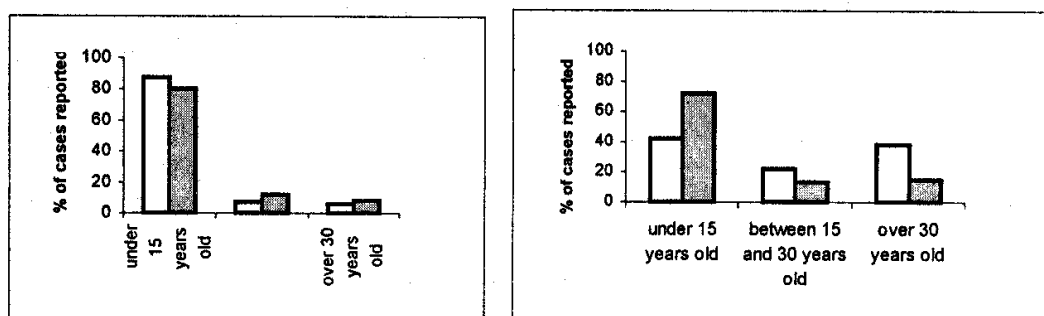


Figure 3. Number of American visceral leishmaniasis cases in each district of the State of Pernambuco, Brazil, between 1990 and 1999

**Table 1.** Number of new cases of leishmaniasis registered in the State of Pernambuco, Northeastern Brazil, between 1990-1999, according to the physiogeographical area and the sex of the infected individuals

	American Cutaneous Leishmaniasis					American Visceral Leishmaniasis				
	No. of cases	% across the State	Male %	Female %	Incidence of cases / 100.000 inhabitants	No. of cases	% across the State	Male %	Female %	Incidence of cases / 100.000 inhabitants
District I (Vitória)	3,167	50.2%	63	37	76.92	374	28.6%	60	40	9.79
District II (Caruaru)	2,828	44.8%	68	32	241.50	471	36.0%	65	35	40.71
District III (Garanhuns)	84	1.4%	64	36	16.86	44	3.4%	63	37	6.75
District IV (Salgueiro)	229	3.6%	67	33	27.25	419	32.0%	70	30	49.20

The proportion of males infected with either ACL or AVL was higher than females in all districts (Table 1). The male: female ratio of disease incidence was relatively similar throughout the districts, and varied between 1,5/1 to 2,3/1. Regarding the age of infected individuals, a higher proportion of people infected with ACL were under 15 years old (Figure 4). The mean age of the patients representing new cases recorded between 1990-1999 was 21,12 (SD +/- 17.00). Most AVL patients were also under 15 years old. The mean age of new cases of infection in the State was 12,48 (SD +/- 12.92). In terms of occupation of the infected individuals above 15 years old, 68.6% were classified as agricultural workers, whereas 31.4% of the cases occurred in patients not directly involved in agriculture (Table 2).



**Figure 4.** General overview of the mean age of individuals infected with American cutaneous leishmaniasis (ACL, white columns) and American visceral leishmaniasis (AVL, gray columns) in Pernambuco, Brazil, between 1990 and 1994 (left) and between 1995 and 1999 (right).

Table 2. Main occupation of people above 18 years old infected with leishmaniasis in the State of Pernambuco, Brazil, between 1990 and 1999

Occupation	Vitória %	Caruaru %	Garanhuns %	Salgueiro %
Rural activities (mainly agriculture)	66.0	67.6	44.8	70.0
Domestic jobs (including housewives)	10.7	10.0	10.4	13.3
Teacher	3.8	-	-	3.3
Student	13.3	21.2	31.0	13.4
Others/retired	6.2	1.2	13.8	-

## DISCUSSION

Pernambuco is not regarded as a major endemic area for leishmaniasis, although the incidence of this disease seems to be increasing (Brandão-Filho et al. 1994). Compared to other Northeastern states in Brazil, Pernambuco had 1,161 cases of ACL between 1990 and 1991, while Maranhão State (which has 5,6 million inhabitants) had 7,427 in the same period (Lacerda 1994). A similar pattern was observed for AVL. Whereas in Pernambuco 177 cases were registered between 1990 and 1991, in the neighbor Bahia State 941 AVL cases were recorded in that period (Lacerda 1994).

The highest incidence of both cutaneous and visceral leishmaniasis cases observed in districts with rainforest remnants, such as Vitoria, can be partially explained by a greater diversity and abundance of insect vectors in those areas, which includes *Lutzomyia longipalpis*, *Lu. whitmani* and *Lu. migonei*. Rainforest fragments in Pernambuco can harbor a wide variety of sandfly species, many of which are involved in disease transmission (Silva 2001). Also, it is common to find houses near the forest borders, which would increase the risk of infection of local populations. The role of tropical forests as reservoirs for *Leishmania* parasites has been demonstrated in a number of field studies carried out in South America (Lainson 1983, 1988; Le Pont et al. 1989).

Regarding the sex of infected people, the higher disease frequency among males may be partially due to the larger proportion of men involved in agriculture, especially in rural areas. This phenomenon was also observed in a 15-year study carried out in Bolivia, where the rates of infection among men were at least three times higher than in women (David et al. 1993). However, engagement in field activities may not be the only responsible for a higher risk of infection, as shown by the high rate of infection among children. Le Pont et al. (1989) observed that in Bolivia the transmission pattern of cutaneous leishmaniasis was similar for men and women. In that case, the intradomiciliar habit of the main vector, *Lutzomyia nuneztovari anglesi*, resulted not only in similar risks for either sex, but also for small children.

The average age of infected people in Pernambuco is lower than that registered in other Northern/Northeastern States in Brazil, such as Acre, located in the Amazonian region, in which the mean age of infected individual was 27,4 years old (Silva et al. 1999). The low age of infected individuals observed in Pernambuco may be a consequence of the early age at which people start working in the field. Also, it may also suggest that the vectors, especially *Lutzomyia longipalpis*, have an increasingly effective adaptation to domiciliar and peridomiciliar environments, being able to feed on small children. In a survey conducted between 1975 and 1983 in Honduras, Navin et al. (1985) reported that 95% of parasitologically proven cases of visceral leishmaniasis affected children under 3 years old.

The high incidence of both ACL and AVL among rural workers found in this survey agrees with studies carried out by Costa et al. (1998) in other Northeastern states. Similarly, Maingon et al. (1994) registered the widespread pattern of leishmaniasis in the coffee-growing states in Venezuela. However, the epidemiology of leishmaniasis in Brazil seems to be going through changes, with higher rates of domiciliar and peridomiciliar transmission (Lainson et al. 1994). As a result, the proportion of infected people involved in urban activities seems to be increasing (Rebêlo et al. 2000). The destruction of rainforest remnants (for instance, for housing) may contribute to the adaptation of insect vectors to urban areas, expanding the transmission cycles in Northeastern Brazil.

It is well known that the two main forms of leishmaniasis have distinct patterns of infection and distribution, but the knowledge of bioecological characteristics of the vector and the infected population may help in the detection of critical areas of high disease incidence. Considering that the notification of cases may not be the sole index for estimating disease prevalence, we believe that only integrated epidemiological studies, involving medical, entomological and physiogeographical data, will help the design of suitable control programmes.

## RESUMO

Perfil da Incidência de Leishmaniose em Dez Anos (1990-1999) no Estado de Pernambuco

Doenças causadas por *Leishmania* são relativamente comuns em áreas rurais do Brasil. Entretanto, estudos ecoepidemiológicos sobre a doença e seus vetores *Lutzomyia* spp (Diptera: Psychodidae) são escassos. Estudou-se a incidência de leishmaniose de janeiro de 1990 a dezembro de 1999 em Pernambuco, com base em dados coletados pela Fundação Nacional de Saúde. Levou-se em conta o perfil das pessoas infectadas, no que concerne à idade, ao sexo e à ocupação, além de fatores fisiogeográficos envolvidos na incidência da doença. Dos 7.616 casos registrados, 82,8%

corresponderam à leishmaniose cutânea, e 17,2%, à leishmaniose visceral. Constatou-se uma maior incidência da doença entre homens e em áreas próximas a remanescentes de florestas. Crianças e jovens apresentaram maiores índices de infecção, assim como os adultos envolvidos em atividades agrícolas. Alterações na abundância e na composição vegetal, associadas a um comportamento adaptativo de fêmeas de espécies vetoras, podem ter contribuído para um aumento na incidência de leishmaniose em áreas urbanas.

DESCRITORES: Epidemiologia. Leishmaniose. Prevalência de doença. Mosquito-palha. *Lutzomyia*

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