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ORIGINAL ARTICLE

# THE SITUATION OF LYMPHATIC FILARIASIS IN THE MUNICIPALITY OF PAULISTA, PERNAMBUCO, BRAZIL

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## ABSTRACT

Cases of Lymphatic Filariasis (LF) have been notified since 1959 in the municipality of Paulista, yet it is still considered an LF-free area. The purpose of this study was to describe the situation of Paulista Health Department. The data were gathered via antigenic surveys carried out in the town, using POC-ICT-AD12 tests. A total of 1,000 individuals, aged 10 and over, were examined in the neighborhoods of Mirueira, Engenho Maranguape, Janga and Maranguape II (250 individuals in each district). Among the individuals evaluated, seven (0,7%) tested positive for antigens using CFA POC-ICT-AD12, 5 out of 250 (2.0%) in the Engenho Maranguape neighborhood and 2 out of 250 (0.8%) in Janga. In this group, one particular individual presented microfilaremia, quantified at 5 Mf/mL. These results suggest that the municipality of Paulista might be a "silent" source of LF continuous transmission, fact that could impact negatively on the goals of the GPELF program meant to provide certification of parasitic disease control and elimination by the year 2022.

KEY WORDS: Lymphatic filariasis; *Wuchereria bancrofti*; epidemiology.

## INTRODUCTION

Lymphatic filariasis (LF) is a neglected disease, endemic to tropical and subtropical regions (Ramaiah & Ottesen, 2014). In 2000, the number of individuals at risk of acquiring this parasitosis was estimated at 1,2 billion, 120 million cases of infected individuals were registered and 40 million cases of filarial morbidity were diagnosed, these individuals were spread over 73 countries worldwide (Hooper et al., 2014).

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In order to eliminate LF by the year 2020, the World Health Organization (WHO) has launched the Global Plan for the Elimination of Lymphatic Filariasis (GPELF) (Ndeffo-Mbah & Galvani, 2017). The GPEFL has activities planned along four stages: i) Mapping and measurement of the affected geographic location of LF by microfilariae (Mf), using thick drop smear, or by circulating filarial antigen (CFA) research, through the point of care immunochromatographic test-AD12 (POC-ICT-AD12); ii) Interruption of outspread of the parasite transmission cycle by Mass Drug Treatment (MDA) of the populations at risk of acquiring the infection, using preventive chemotherapy with a single dose of Albendazole (400 mg), combined with Ivermectin (150-200 μg) or Diethylcarbamazine (DEC) (6mg / kg) doses once a year for 4-6 years, with a minimum coverage of 65%; iii)Verification and validation of transmission interruption through Transmission Assay Surveys (TAS), carried out at least twice with an interval of 2-3 years for each TAS and iv) Post-TAS surveillance. Meanwhile elimination programs must develop actions for Morbidity Management and Disability Prevention (MMDP), ensuring morbidity management in the basic health structure of endemic countries, as well as vector control (WHO, 2005; Ichimori et al., 2014; Rebollo & Bockarie, 2017).

In the Americas, there are active LF transmission records in four countries: Brazil, Guyana, Dominican Republic and Haiti, this last presenting the highest prevalence (Ben-Chetrit & Schwartz, 2015). Brazil, a GPELF signatory, approved the 190/96 National Health Council Resolution, which implemented the National Plan for the Elimination of LF (NPELF) (Rocha et al., 2016). The implementation of the NPELF eliminated the previous endemic foci, so that the Metropolitan Region of Recife (MRR), located in the State of Pernambuco - encompassing Recife, Olinda and Jaboatão dos Guararapes - remained the only endemic area in the country. In these municipalities, the application of MDA, with the exclusive use of DEC, resulted in a significant reduction in the prevalence of microfilaremia. In Recife, the prevalence of the parasitosis decreased from 6.5% in 1996 to 0% in 2014 (Maciel et al., 1996; PAHO, 2015). These results indicate the interruption of MDA and the need for a reassessment through TAS to certify the absence of active transmission (WHO, 2014).

The first study to include Paulista as a probable LF endemic area, was performed by Dobbin and Cruz in 1967. At that time, a prevalence of less than 1% of microfilaremia was identified and positively diagnosed individuals were treated, causing the municipality to again be considered free from active transmission. In 1999, approximately thirty years after the first survey in Paulista, a study involving nearly twenty-four thousand Brazilian Army soldiers, with the purpose of evaluating the LF dispersion in the RMR, detected three microfilaremic autochthonous individuals in three neighborhoods which were not then recognized as presenting active transmission; among them, the

districts of Maranguape and Janga, districts located in the municipality of Paulista (Medeiros et al., 1999).

Since then actions have been underway in the municipality to evaluate the current situation of the parasitosis, as well as to subsidize the development of control and elimination strategies. However, so far nothing has been published to clarify the LF situation in the area. Therefore, the purpose of this study is to describe the current situation of the parasitosis in Paulista and provide useful information to guide the NPELF about MDA intervention in this area.

## MATERIAL AND METHODS

The study was carried out in four of the 25 districts of the municipality of Paulista: Mirueira, Engenho Maranguape, Janga and Maranguape II. These areas were selected due to the prevalence of microfilaremia ranging from 0.25% to 0.80% between 2001 and 2008 (Unpublished data). The municipality of Paulista is located along the north coast of the State of Pernambuco, Brazil. It borders the municipalities of Abreu and Lima, Igarassu, Paudalho, Camaragibe, Recife and Olinda, these last two recognized as endemic for LF (Figure) with an area of 97,312 $Km^2$ and a population of approximately 325,590 inhabitants. The municipality presents a sewage coverage of 60.8% and 20.8% urbanization of public roads (IBGE, 2016). The municipality has 42 basic health units, 11 family health teams, 6 polyclinics and 4 health centers with specialists. It also has 1 reference center in physiotherapy, 2 social assistance reference centers, 2 for psychosocial assistance and 1 municipal laboratory.

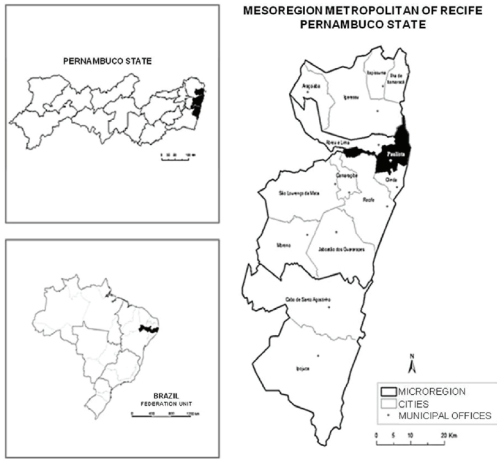


*Figure*. Map of the Metropolitan Region of Recife, Pernambuco, Brazil. In particular, the city of Paulista, which borders the cities of Recife and Olinda, areas known to be endemic for lymphatic filariasis.

A descriptive study was carried out based on the database records of the Health Department of the Municipality of Paulista, mainly from the LF Control Program. A pilot survey was carried out without a sample calculation. The data were gathered via antigenic surveys conducted in the municipality, from March to July 2011, in which 1,000 randomly selected individuals aged 10 years and over (250 individuals per area), were tested using POC-ICT-AD12 (Filariasis Now, Binax Inc., Portland, Maine, USA). Complementary laboratory evaluations were performed using Polycarbonate Membrane Filtration Techniques (Oliveira et al., 2014; Rocha, 2014) for detection and quantification of microfilaraemia (PMFDQMf), and CFA-Og4C3-ELISA (TropBio®, Pty Ltd, Townsville, Queensland, Australia) for quantification of the antigenemia in POC-ICT-AD12 positives. Samples with ≥ 128 unit antigen (UA) counts were considered positive, following the test manufacturer guidelines. All the intra-domiciliary contacts from the POC-ICT-AD12 positives were also evaluated by the same assay.

The data obtained in the study were processed and submitted to statistical analysis using EpiInfo software, version 6.04d. Descriptive statistics were applied, and the frequency distribution was the measure adopted to express the values found in the study.

All participants in the research or their parents or legal guardians, signed a Free and Informed Consent Form. This study was approved by the Ethics Committee of the Aggeu Magalhães Research Center (CAEE: 65044117.2.0000.5190).

## RESULTS

A total of 1,000 individuals were examined through POC-ICT-AD12 in the neighborhoods of Mirueira, Engenho Maranguape, Janga and Maranguape II (250 individuals in each neighborhood). 52% of the population studied were male and 48% female, with ages ranging from 10 to 68 years, with an age average of 26 years. Among the individuals evaluated, seven (0.7%) tested positive for LF antigens using CFA POC-ICT-AD12, 5 out of 250 (2.0%) in the Engenho Maranguape neighborhood and 2 out of 250 (0.8%) in Janga. Among the positives, 3 individuals were males and 4 females (Table), with a mean age of approximately 39 years.

Complementary evaluation of antigen-positive-subjects showed that 5 out of 7 tested negative using both polycarbonate membrane filtration and CFA-Og4C3-ELISA. Two males from the city of Olinda-PE, aged 28 and 68 years respectively, tested positive using CFA-Og4C3-ELISA (390 and 332 UA), both residing in the Engenho Maranguape neighborhood for about eight and twenty years respectively. Only the 28-year-old individual presented microfilariae by PMFDQMf, quantified at 5 Mf/mL. All other individuals living with the positive-subject in the same house tested negative using POC-ICT-AD12.

*Table.* Distribution of examined individuals, according to age and sex, in the four studied districts of the city of Paulista, Pernambuco, Brazil

| District | Examined | Positives | | | |
|---|---|---|---|---|---|
| | | Male | | Female | |
| | | N | % | N | % |
| Mirueira | 250 | 0 | 0.0 | 0 | 0.0 |
| Engenho Maranguape | 250 | 2 | 0.8 | 3 | 1.2 |
| Janga | 250 | 1 | 0.4 | 1 | 0.4 |
| Maranguape II | 250 | 0 | 0.0 | 0 | 0.0 |
| Total | 1.000 | 3 | 0.3 | 4 | 0.4 |

## DISCUSSION

Despite the numerous elimination and control actions proposed by the GPEFL, LF remains an important worldwide public health problem (WHO, 2016). In Brazil, the activities of the NPEFL resulted in the elimination of important foci. Nonetheless, the efforts made were not sufficient to successfully interrupt transmission of this parasitic disease in the country by the year 2015 (Ministry of Health, 2009; PAHO, 2015). Currently, NPELF's actions are focused on assisting patients with filarial morbidity, as well as monitoring old foci and eliminating the focus in Pernambuco. In this context, this study reports relevant information about the epidemiological situation of LF in Paulista-PE.

The evaluation of the 1,000 individuals distributed in the four districts identified a total prevalence of 0.7% of the CFA. However, the analysis stratified by neighborhood identified a prevalence of 2.0% and 0.8% in the districts Engenho Maranguape and Janga, respectively. According to WHO data, evaluations performed in the population or any population subunit (locality or urban area) with CFA or microfilaraemia (Mf) $\geq$ 1% should be considered as endemic and intervention with preventive chemotherapy (MDA) should occur, since the total population of that locality may be at risk of acquiring the filarial infection (WHO, 2011).

The high rate of antigenemia identified in the neighborhood of Engenho Maranguape together with a positive case of microfilaremia confirms the findings of Medeiros et al., who in 1999 had already suggested the presence of autochthonous cases in this locality. These results support the possibility of LF active transmission occurrence in this area. Although the microfilaremic individual presented a low parasitic load (5 Mf/mL), it does not invalidate the possibility that he, as well as other individuals with similar characteristics, signify a residual source of vector infection, ensuring the maintenance of LF

transmission in the area. Particularly considering that in this region the main vector is *Culex quinquefasciatus*, a mosquito known to be highly efficient at infecting individuals with low or very low parasitemia (Ramaiah et al., 2002; Ministry of Health, 2009; Rebollo et al., 2015; Sunish et al., 2015).

The geographical proximity of the MRR districts and the intense migration of individuals residing in these localities are factors that not only hinder the control and elimination of LF, but may also spread it to other areas. Medeiros et al. (2004), when evaluating the expansion of LF in MRR, identified the existence of microfilaraemia cases in the municipality of Moreno, an area considered to be LF-free. Although they were not autochthonous cases, the authors draw attention to potential new foci in the area due to favorable conditions, mainly environmental, as well as high vector density in the area. They also emphasized the role of migrating Mf-positive individuals as an important factor of LF occurrence in these LF-free areas, since LF is considered a "silent" parasitic infection (Medeiros et al., 2004). Other studies highlight the threat that the migratory process can lead to the failure of GPELF goals, particularly in areas where the vector is *C. quinquefasciatus* (Triteeraprapab et al., 2000; Ramaiah, 2013. Nunes et al., 2016).

The results found suggest that the municipality of Paulista could be functioning as a "silent" source in the maintenance of LF continuous transmission in the RMR, placing at risk NPELF goals, a program which validates the elimination of LF as a public health problem by the year 2022 (PAHO, 2015). For this reason, epidemiological studies of greater magnitude are necessary in order to increase the number of examined individuals and evaluated areas along with vector survey. Another aspect to be verified is the situation of local filarial morbidity, since there are no records of specific studies regarding the occurrence and distribution dynamics of morbid cases of the disease. This information would allow us to know the real situation of LF in Paulista and aid the Health Department of the municipality together with the State Health Secretariat of Pernambuco and the PNEFL to determine control and elimination strategies, defined or not by the implementation of MDA in the Municipality. It is crucial that NPELF and the municipalities surrounding the endemic municipalities of Recife, Olinda and Jaboatão dos Guararapes carry out LF-related studies to ensure that LF is not expanding to other municipalities or even to other States of the Federation, considering the presence of the high density *C. quinquefasciatus* vector can be noted all over the country.

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