ASSESSMENT OF LEISHMANIASIS NOTIFICATION SYSTEM IN SANTIAGO DEL ESTERO, ARGENTINA, 1990–1993

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Abstract.   Using a capture-recapture method, this study evaluates the completeness of the cutaneous leishmaniasis (CL) surveillance system in four districts of Santiago del Estero province, Argentina, for the period 1990–1993. Four reporting sources were evaluated: medical records kept by health facilities, interviews conducted during a case-control study, and the national and provincial levels of the leishmaniasis surveillance system (LSS). Using the capture-recapture method it was estimated that 210 cases (95% confidence interval [CI]: 202–218) of CL occurred in the four districts during the study period. Completeness of reporting to the leishmaniasis surveillance system at the national level was estimated to be 44.8% (95% CI: 43.2–46.4). The study results indicate that there is substantial under-reporting within the LSS, although it did show the appropriate secular trends. The reasons for under-reporting and methods for addressing this problem are discussed.

INTRODUCTION

Leishmaniasis represents a significant burden to public health in endemic areas, in terms of both morbidity and mortality.[1,2] However, the disease is notifiable in only 32 of the 88 countries where it is prevalent; in others, the reporting system is judged inadequate.[3,4] On the American continent, it is estimated that for each reported case, another five cases occur.[5] It is estimated that 2 million new cases of leishmaniasis occur worldwide, including 1.5 million cases of cutaneous leishmaniasis (CL) and 0.5 million of visceral leishmaniasis (VL).[5]

The aims of this study were to estimate the number of new CL cases that occurred in four districts of the province Santiago del Estero, Argentina, during the period 1990–1993, and to provide an indication of the completeness of reporting to the leishmaniasis surveillance system.

MATERIALS AND METHODS

In Argentina, health facilities are required to keep records of the patients that seek medical attention, including their diagnosis. This is done by completing a single medical record common to all hospitals. A leishmaniasis case requires, and should receive, medical treatment. Thus, each treated case of leishmaniasis should have a medical record at the hospital or health center where the examination took place or treatment was provided. The specific treatment is provided free of charge by the Leishmaniasis Control Program.

There are two surveillance systems in Argentina that collect data on cases of leishmaniasis: the mandatory communicable disease surveillance system (National System of Epidemiological Surveillance, SINAVE) and the leishmaniasis surveillance system (LSS), which is internal to the Leishmaniasis Control Program.

National System of Epidemiological Surveillance. In Argentina, notification to the public health authorities has been compulsory since 1960 for more than 40 diseases, including leishmaniasis. The list of diseases or conditions included in the published list of mandatory reporting has changed over time, and may vary from province to province.

The National System of Epidemiological Surveillance is organized in multiple levels of reporting. The number of hierarchical levels depends on how the health system is organized in each province. In Santiago del Estero, the system is organized in three levels: the local or health facility level (HF), intermediate or provincial level (SINAVEPL), and central or national level (SINAVENL). Usually, the information is reported by the physician or a primary health worker to the local level (hospital or clinic). Some diseases, such as poliomyelitis that requires immediate public health action, must be notified by telephone or fax within 24 hours of the identification of the case. Otherwise, each HF consolidates the information received and forwards it on a weekly basis to the SINAVEPL. This level collates and reviews the information and sends it to the SINAVENL. Thus, both national and provincial levels receive and keep only the aggregated data of CL cases by age, sex, district, or province. These data do not allow the individual identification of cases.

According to SINAVE, 6,673 leishmaniasis cases were reported from 10 northern provinces between January 1954 and June 1999. The average annual number of cases reported was 64 between 1954 and 1979, and 250 between 1980 and 1999. The number of reported leishmaniasis cases from Santiago del Estero was low prior to 1980, with an average of 2 cases per year. A total of 261 cases were reported between 1980 and 1999, of which 103 (40%) occurred between 1990 and 1993. Ninety-five percent of the cases reported between 1980 and 1993 were cutaneous leishmaniasis (Epidemiology Department of Ministry of Public Health, unpublished data). *Leishmania* isolates from eight patients with CL ulcer from Santiago del Estero studied by biological and molecular methods were classified *Leishmania* (Viannia) *braziliensis.*[6]

Leishmaniasis surveillance system. The leishmaniasis surveillance system is one of the activities of the Leishmaniasis Control Program, and has been in existence since 1987. The dissemination of the information in this system operates in the same way as SINAVE. The leishmaniasis surveillance system is also organized in three levels. The HF forwards the leishmaniasis standard form received from the attending physician who made the diagnosis to the provincial level

(LSSPL) on a weekly basis. The leishmaniasis standard form contains the following information: name and surname or a unique identifier, sex, age, and place of residence, as well as medical and epidemiological information (e.g., form of leishmaniasis, type of ulcer [single or multiple], treatment, migration and travel activities, and occupation). The LSSPL reviews the records and contacts with the local level if action or further information is needed, and forwards the data to the national level (LSSNL).

Data collection. Multiple sources were reviewed to identify CL cases for the years 1990, 1991, 1992, and 1993 for four districts of Santiago del Estero province; i.e., Atamisqui, Loreto, San Martin, and Silipica. These sources were: 1) Seven study hospitals that include the four hospitals that provide health services to the entire patient population of the aforementioned districts and three referral hospitals located in the capital city of Santiago del Estero province. All the medical records of CL cases identified at the study hospitals surveyed were entered in Epi Info (version 6, Center for Disease Control and Prevention, Atlanta) and checked for duplicate records and completeness. Links between a person's name on the list of each hospital, as well as among hospitals were made using first name and surname. These were validated using other variables such as sex, age, date of CL onset, and place of residence. Medical records of cases coming from other districts were excluded. Following this process, a list of cases was generated (HF). 2) Leishmaniasis surveillance system at the provincial level data set. 3) Leishmaniasis surveillance system at the national level data set. And 4) data from a case control study (CCS) carried out to investigate the risk factor for CL in Atamisqui, Loreto, and San Martin and Silipica districts in April 1994 (Yadón and others, unpublished data). All the persons listed at both levels of LSS and those listed in HF, after eliminating the duplicates, were invited to participate in the case-control study. Cases and their respective control subjects were asked to give informed consent to participate in the study. Ethical approval was obtained from the ethics committee of the London School of Hygiene and Tropical Medicine. As part of the case-control study, 164 of the 189 CL listed cases and 318 controls were interviewed and asked whether they knew of any other members of their community with signs of CL disease. We also reviewed the SINAVE data set. Because the data gathered by SINAVE is based only on case counts, the evaluation of its completeness using a capture-recapture method could not be done; individual case identification is not available from this system.

Evaluation of completeness of reporting. To estimate the completeness of reporting of CL cases in four districts of Santiago del Estero, all the cases listed in the HF and CCS were combined and a pooled list of cases was obtained. For the purpose of this study, this list is named "analytic source" (AS). Cases were cross-classified according to whether they were listed at LSSNL and/or in the analytic source, as follow: cases listed at both the LSSNL and AS; cases listed at the LSSNL but not at the AS, and cases listed at the AS but not at LSSNL respectively. To evaluate the completeness of the reporting system a two-sample capture-recapture method was used.[7] The total number of CL cases that occurred in the population was estimated using the following formula:
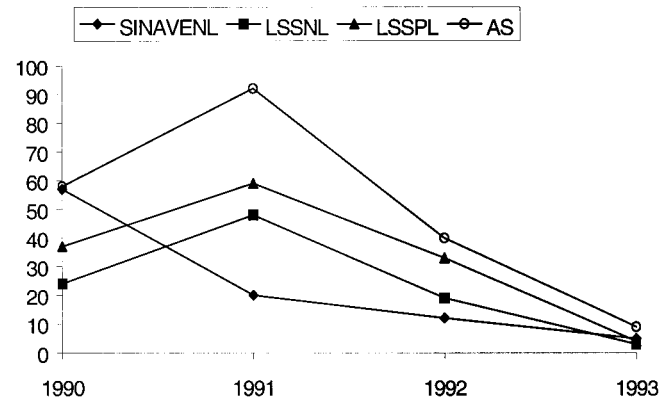

FIGURE 1.   Number of reported cases of cutaneous leishmaniasis (CL) by source of information and year, 1990—1993, study area, Santiago del Estero, Argentina. SINAVEL = National System of Epidemiological Surveillance, National Level; LSSNL = Leishmaniasis Surveillance System, National Level; LSSPL = Leishmaniasis Surveillance System, Provincial Level; AS = analytic source.

$$N = \frac{(M + 1)(n + 1)}{(m + 1)} = -1$$

The variance (Var) of N was estimated by the following:

$$Var = \frac{(M + 1)(n + 1)(M - m)(n - m)}{(m + 1)^2(m + 2)}$$

where:
M is the number of cases identified in the AS, **n** is the number of cases identified at the LSSNL, and **m** is the number of cases registered in both AS and LSSNL.

And the confidence interval was estimated using the formula:

$$95\% \ CI = \pm 1.96\sqrt{Var \ (N)}$$

RESULTS

Between 1990 and 1993 in Santiago del Estero province, 103 CL cases were reported to the SINAVENL, 136 to the LSSNL, and 171 to the LSSPL. Most of the CL cases reported from Santiago del Estero province to the LSSNL (94 of 136, 69%) and LSSPL (131 of 171, 77%) during this period were from four contiguous districts: Atamisqui, Loreto, San Martin, and Silipica.

Figure 1 shows the number of CL cases reported to SINAVENL, LSSNL, LSSPL, and those listed at the analytic source during the study period. The pattern depicted by each source, with the exception of the SINAVENL, was similar during all four years of the study period. The number of reported cases of CL increased in 1990, peaked in 1991, and declined in 1992 and 1993. However, the SINAVENL curve shows not only that the SINAVENL recorded fewer CL cases than the other sources, but that it also failed to identify the increase of 1991.

Table 1 presents the number of ascertained CL cases, by source, for the four districts. A total of 189 cases of CL were identified in the HF data set, 131 cases were abstracted from the LSSPL, and 94 cases from the LSSNL. Fourteen additional CL cases were identified during the case-control study. The latter were not registered in any of the reviewed

TABLE 1

Number and percentage of cutaneous leishmaniasis (CL) cases recorded, by source: Atamisqui, Loreto, San Martin, and Silipica districts, Santiago del Estero, Argentina, 1990–1993

Source	No. Of CL cases recorded	percentage of cases
HF	189	44
LSSPL	131	31
LSSNL	94	22
CCS	14	3
Total	428	100

HF = health facilities, LSSPL = Leishmaniasis Surveillance System Provincial Level; LSSNL = Leishmaniasis Surveillance System National Level; CCS = case control study.

TABLE 2

Overlap of cutaneous leishmaniasis (CL) cases identified in the study area, by source. Santiago del Estero, Argentina, 1990–1993

Source	No. or CL cases	Percentage of cases
HF	58	28
HF and LSSPL	42	20
HF, LSSPL, and LSSNL	89	43
LSSNL	5	2
CCS	14	7
Total	208	100

HF = health facilities; LSSPL = Leishmaniasis Surveillance System Provincial Level; LSSNL = Leishmaniasis Surveillance System National Level; CCS = case control study data.

sources, despite the fact that 10 patients (71.4%) indicated that they had sought medical attention at one of the study hospitals.

After aggregating all the cases and eliminating any duplicates, a total of 208 CL cases were registered in any of the sources reviewed in the study period (Table 2). Of the 208 CL listed cases, 89 (43%) were registered at three of the four sources reviewed, 42 (20%) were registered at only two sources, while 73 (35%) were registered at only one source. Of the 14 CL cases identified during the case-control study, 10 (71.4)% stated that they had sought medical attention. If we assume that these cases were registered in the HF data set, a total of 199 cases should have been identified in that source.

In the absence of a gold standard to assess completeness of the LSSNL, a capture-recapture method was used by which a total of 210 (95% CI: 202–218) new CL cases were estimated. This estimate indicates that the completeness of the LSSNL was 43.3% (95% CI: 41.8–45.0), and the completeness of the AS was 94.8% (95% CI: 91.4–98.4). The sensitivity of LSSNL and AS combined was 97.1% (95% CI: 93.7–100.0).

DISCUSSION

Using a capture-recapture method we estimated that 210 new cases of CL had occurred during the 4-year period. The study indicates that there is substantial underreporting of CL both to the National Epidemiological Surveillance System and the Leishmaniasis Surveillance System from the study area.

The reporting trends were similar among the sources, with the exception of the national level, SINAVENL. The number of CL cases reported to the SINAVENL in 1990 did not differ greatly from the number of cases registered at the health facilities. However, in 1991 and 1992, the SINAVENL recorded fewer cases than the health facilities by a factor of 4.6 and 2.8, respectively. This would indicate that the crude count, in the absence of hospital record reviews or individual reporting to the LSS, was not useful in monitoring CL disease. On the contrary, the monitoring of LSS, even with a low sensitivity, 43.3% (95% CI: 41.8–45.0), exhibited a trend that followed that of cases registered in the HF data set. In addition, the analysis indicates that there was a correlation between the increase in the incidence of CL in the community and the reporting efficiency to LSSNL. This correlation has been reported in relation to other diseases,

such as measles and pertussis.[8] The differences found between both systems might be explained in part by the fact that the Leishmaniasis Control Program provides specific drugs for CL treatment to hospitals that forward case reports to its surveillance system.

The validity of the estimate provided by the capture-recapture method is subject to the accuracy of the case diagnosis. For instance, if the health facility registry contains a large proportion of incorrect diagnoses, the number of cases reported would be underestimated. During the case control study, we verified the diagnosis of every patient included in the study according to clinical, parasitological, and immunological, criteria. In this process, we found that 87% of the cases included in the present study met the confirmed case definition and 13% met the probable case definition.

If the estimate of the number of cases is not based on all cases that occurred in the study areas, then bias may be introduced. To avoid this bias we included all seven hospitals that might have received patients with CL from the study area (four located in the study area and three located in the capital of Santiago del Estero), and all the subjects whose names were provided as CL cases by the interviewees during the case control study. One other possible limitation of this study is the fact that it was carried out during an epidemic period, which could have lead, as suggested by the results, to an increase in the notification efficiency that parallels the increase in the incidence of the disease.

Other studies that analyzed active and passive case detection of CL have also detected a high proportion of underreporting. For instance, Copeland and others[4] found that, in Guatemala, only 2.5% of CL cases were reported to the surveillance system. Similarly, in Bihar State, India, Sanyal and others[9] estimated that 100,000 visceral leishmaniasis (VL) cases had occurred during a one-year study period, while only 18,585 VL cases had been reported (i.e., a factor of 5). Under-reporting was also described for other communicable diseases,[10,11] as well as non-communicable diseases.[12–14]

It is important that the National Leishmaniasis Program evaluate the percentage of underreporting in other endemic provinces of the country by reviewing data at all of the reporting points, as well as using other sources of information, such as records from the primary health services and private clinics. Meanwhile, the National Leishmaniasis Control Program might consider the use of our estimated level of under-notification when programming activities, such as the provision of drugs.

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