The hidden prevalence of leprosy: a comparative study between two Brazilian cities

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http://dx.doi.org/10.1590/1806-9282.66.10.1338

INTRODUCTION

Leprosy is an infectious, chronic, neglected disease, whose etiological agent is Mycobacterium leprae. It is an obligate intracellular parasite with an affinity for the skin and peripheral nerves, causing dermatological and neurological lesions and deformities, depending on the immunogenic potential of the bacillus and the human organism’s response time. Brasil holds the first place worldwide in detection coefficient and the second place in absolute number of new registered cases, after India. In 2016, there were 214,783 new cases of leprosy worldwide, which represents a detection rate of 2.9/100,000 population, according to the WHO. This year, Brasil reported 25,218 new cases, with a detection rate of...
The estimated hidden prevalence was calculated using the method proposed by Gil Suárez and Lombardi\(^8\) and indicated by the PAHO and the WHO, which is based on the assumption that diagnoses of cases with physical disabilities indicate late detection and, thus, the presence of undiagnosed cases within a determined area. Accordingly, calculations are obtained using the following coefficients:

1. Annual percentage of cases with disability grades = cases with disability / cases evaluated.
2. Annual estimated hidden prevalence = new cases × percentage of cases with disabilities.

Forms used by healthcare professionals at the moment of patient diagnosis to evaluate the disability grade were filled out in accordance with the parameters stipulated by the Ministry of Health\(^9\). The following criteria were considered: grade 0, there is no neural involvement in the eyes, hands or feet; grade 1, there is a decrease or loss of sensation; and grade 2, presence of disabilities and deformities such as lagophthalmos, claws, bone resorption, drooping hands and feet, among others\(^9\).

This study did not require approval from the ethics committee as it used open public domain data without the identification of individuals.

RESULTS

Between the years 2007 and 2017, in the city of Juazeiro, Bahia, 1,561 new cases of leprosy were notified, corresponding to an average detection coefficient of 65 cases/100,000 population. The detection coefficient in the general population decreased from 79.0/100,000, in 2007, to 51.9/100,000 in 2017. The proportion of individuals with physical disabilities was greater than 10% in all years of the time series, reaching 27.6% in 2008 (Figure 1).

The number of new cases of leprosy showed no large variations during the study period, with an arithmetic mean of 142 cases per year. During the study period, 208 (13.3%) patients were diagnosed with disability grade 1, and 81 (5.2%) were diagnosed with grade 2. Furthermore, 28 (1.8%) patients were not assessed for their disability grade at the time of diagnosis (Table 1).

When analyzing the percentage of cases of patients with disabilities in relation to the number of cases evaluated, the highest percentage of patients with some disability grade was observed in 2008, when 27% of the 159 new cases notified presented some degree of disability; on the other hand, in 2015, there was a...
significant drop in the number of cases of patients diagnosed with disabilities which were registered in only 11.3% of the 133 new cases (Table 1).

Making use of the method proposed by Gil Suárez and Lombardi[10], it was estimated that approximately 295 cases of leprosy were not diagnosed and/or registered between the years of 2007 and 2017, in Juazeiro, Bahia. This number would represent an addition of 18.9% to the registered prevalence and would result in a real prevalence of 1,856 cases during the period. This result was obtained by the sum of the known prevalence (1,561 cases) and the hidden prevalence

**FIGURE 1.** DETECTION RATE IN GENERAL POPULATION (A) AND PERCENTAGE OF DISABLED PATIENTS - DEGREE 1 AND 2 (B) IN THE PERIOD FROM 2007 TO 2017 IN JUAZIEIRO-BA AND JOINVILLE-SC.

**TABLE 1.** NUMBER AND PERCENTAGE OF NEW CASES OF LEPROSY AND DEGREE OF DISABILITY FROM 2007 TO 2017 IN JUAZIEIRO-BA AND JOINVILLE-SC.

| Year of diagnosis | Degree zero n (%) | Degree 1 n (%) | Degree 2 n (%) | Not rated n (%) | Total |
|-------------------|------------------|----------------|---------------|----------------|-------|
| 2007              | 117 (73.6)       | 34 (21.4)      | 3 (1.9)       | 5 (3.1)        | 159   |
| 2008              | 113 (71.1)       | 29 (18.2)      | 14 (8.8)      | 3 (1.9)        | 159   |
| 2009              | 115 (79.9)       | 20 (13.9)      | 7 (4.9)       | 2 (1.4)        | 144   |
| 2010              | 152 (80.4)       | 27 (14.3)      | 8 (4.2)       | 2 (1.1)        | 189   |
| 2011              | 142 (82.1)       | 23 (13.3)      | 7 (4.0)       | 1 (0.6)        | 173   |
| 2012              | 129 (84.9)       | 14 (9.2)       | 7 (4.6)       | 2 (1.3)        | 152   |
| 2013              | 98 (76.6)        | 12 (9.4)       | 11 (8.6)      | 7 (5.5)        | 128   |
| 2014              | 99 (79.2)        | 191 (5.2)      | 3 (2.4)       | 4 (3.2)        | 125   |
| 2015              | 116 (87.2)       | 7 (5.3)        | 8 (6.0)       | 2 (1.5)        | 133   |
| 2016              | 72 (85.7)        | 8 (9.5)        | 4 (4.8)       | 0 (0.0)        | 84    |
| 2017              | 9179(1)          | 15 (13.0)      | 9 (7.8)       | 0 (0.0)        | 115   |
| Total             | 1244 (79.7)      | 208 (13.3)     | 81 (5.2)      | 28 (1.8)       | 1561  |

Source: SINAN leprosy database, 2007-2017.
terms of geographic location and economic and social situation, present detection coefficients which are, respectively, very high and average, as well as a high proportion of cases diagnosed with some disability grade, especially grade 1. The evaluation of physical disability grade is an essential procedure in the initial approach to patients receiving healthcare services for leprosy.

Considering that leprosy is an endemic disease in Brazil, the need for more efficient control strategies within national territory is clear. Examples of such strategies include increasing access to basic healthcare, qualifying professionals to recognize signs and symptoms of the pathology, and developing educational actions in healthcare that will make it possible to diagnose and treat more cases earlier. The disease is usually associated with regions with low socio-economic indexes; however, the observation that Joinville presents a considerable detection rate and an elevated hidden prevalence is contrary to what would be expected, given that, according to municipal human development index (MHDI) data from 2012 to 2017, the city had a value of 0.809, which is considered very high by the United Nations (UN), and it held the 21st position in the ranking of Brazilian cities.

Juazeiro, on the other hand, presented an MHDI of 0.677, considered average, and it held the 2,503rd position in the ranking, during the same period. Keeping in mind that the fundamental parameters of MHDI are per capita income, education, and life expectancy (characteristics of regions that are socio-economically well developed), Joinville could be considered a city with good health conditions. A disease related to poverty would, thus, be expected to have lower rates of detection and hidden prevalence, in light of the high quality of life, more health information available to the public and, consequently, more access to services provided to the population.

Juazeiro is a reference center for the diagnosis of cases of leprosy, not only in the Vale do São Francisco Region, but also in the state of Bahia. It has, for a few decades, had a Regional Reference Center, where a leprosy specialist, dermatologist, physical therapist, and epidemiological surveillance team work together and are responsible for a significant part of diagnoses, as verified by the high detection coefficient and the high incidence observed in this article’s data analysis and according to information from the local secretary of health. As seen in the tables, the problem persists for a considerable percentage of patients who receive...
a late diagnosis when they already present a disability grade, likely due to the absence of investment in health education by public institutions and to the rotation of the teams that have already been trained to manage this disease, which entails a delay in carrying out the diagnosis and early treatment. This problem ends up negatively influencing the context in which the disease is combated and eliminated, contributing to an increase in the incidence and rate of detection, given that untreated patients are important sources of transmission of the etiological agent.

In the state of Santa Catarina, Joinville is the city with the highest number of cases of leprosy. The municipality has a Municipal Sanitary Unit Leprosy Program, which provides care and treatment through the Unified Health System. The team that provides regional support is composed of medical doctors, nurses, psychologists, physical therapists, and social workers. In addition to this program that has been made available, the population also has access to healthcare in the form of diagnosis and treatment at Basic Healthcare Units, as well as home follow-up by community health agents, thus guaranteeing integral care. Notwithstanding the strategies developed in this municipality for combating the disease, gaps still exist, both on public healthcare services and due to the population’s lack of knowledge regarding the disease.

In order to evaluate the health levels of a population, the absolute values of cases of a disease or injury should not be utilized, because they do not take the population size into consideration. For this reason, health indicators have been constructed in the form of ratios. In this context, when analyzing the absolute values of the city of Joinville, a considerably lower number of cases was observed, with a prevalence rate of 0.12 per 10,000 population, which is considered low; in contrast, the average detection coefficient was 4.28 per 100,000 population, which classifies it as a medium endemic city. Despite these coefficients, this city has a considerable hidden prevalence, as shown in the observed data. These values reflect problems on the operational level, showing that, notwithstanding efforts to eliminate the disease over the past decades, there have been irregularities in the work of the teams responsible for diagnosis and follow-up, both at the primary healthcare units and at the reference units. In addition to this, many patients either do not know the signs and symptoms of this disease or they believe that it no longer exists, especially since this is a city with high socio-economic development. This, therefore, provides evidence of the need to continue investing in health policies in this region.

CONCLUSION

In relation to the panorama presented by these cities, we have observed a detection rate capable of impacting continuity of transmission in both areas, with a high hidden prevalence of the disease, especially in Joinville-SC. This means that it is necessary to undertake efforts not to relax disease control in these cities that have shown apparent decreases in the number of leprosy cases and to monitor closely areas where new cases with some disability grade are notified, given that these are, consequently, areas with a high hidden prevalence, in order to take steps, albeit at a late stage, toward the actual elimination of this disease as a public health problem.

Author’s Contribution

All author’s participated equally in the concept development, study planning, data collection and analysis, discussion of the results, scientific drafting, as well as in the revision and approval of the final version of the work.
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