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Epidemiological analysis of leprosy in Iguatu, Ceará (2014-2024)

Análise epidemiológica da Hanseníase em Iguatu, Ceará (2014-2024)

Análisis epidemiológico de la lepra em Iguatu, Ceará (2014-2024)

ABSTRACT

Objective: To analyze the epidemiological profile of leprosy in patients from the municipality of Iguatu, located in the Centro-Sul region of the state of Ceará, from 2014 to 2024. **Methods:** It is an ecological, descriptive study using data from the National Notifiable Diseases Information System (SINAN). **Results:** During the analyzed period, 347 cases were reported, with a predominance of males, mixed-race individuals, urban residents, ages between 50 and 59 years, and individuals with incomplete elementary education. Additionally, there was a predominance of multibacillary form, dimorphic clinical presentation, zero degree of physical disability, new cases as the mode of entry, and cure as the mode of exit. **Conclusions:** The profile highlights the influence of social determinants and suggests late diagnosis, epidemiological surveillance, and Primary Health Care.

Keywords: *Leprosy; Epidemiology; Public Health; Epidemiological surveillance.*

RESUMO

Objetivo: Analisar o perfil epidemiológico da hanseníase no município de Iguatu, localizado na região Centro-Sul do estado Ceará, no período de 2014 a 2024. **Método:** Trata-se de um estudo ecológico, descritivo, com dados do Sistema Nacional de Notificação de Agravos à Saúde (SINAN). **Resultados:** No período analisado foram notificados 347 casos, com predominância de homens, indivíduos pardos, residentes na zona urbana, idade entre 50 e 59 anos e com baixa escolaridade. Observou-se maior frequência da forma multibacilar, apresentação clínica dimorfa, grau de incapacidade física zero no diagnóstico e desfecho cura. **Considerações finais:** O perfil evidencia a influência dos determinantes sociais e sugere diagnóstico tardio, apesar da

elevada proporção de cura. Destaca-se a necessidade de fortalecer o diagnóstico precoce, a vigilância epidemiológica e a Atenção Primária à Saúde.

Descritores: *Hanseníase; Epidemiologia; Saúde pública; Vigilância epidemiológica.*

RESUMEN

Objetivo: Analizar el perfil epidemiológico de la lepra em pacientes del municipio de Iguatu, en la región Centro-Sur del estado de Ceará, durante el período de 2014 a 2024. **Método:** Se trata de un estudio ecológico descriptivo, com datos del Sistema Nacional de Notificación de Agravios a la salud (SINAN). **Resultados:** Em el período analizado, se notificaron 347 casos, con predominio del sexo masculino, personas de raza parda, residentes en la zona urbana, con edades entre 50 y 59 años, y com educación primaria incompleta. Además, se observó predominio de la forma multibacilar, presentación clínica dimórfica, grado de incapacidad física cero, modalidad de entrada caso nuevo y de salida curación. **Conclusión:** El perfil evidencia la influencia de los determinantes sociales y sugere diagnóstico temprano, a pesar de la elevada proporción de curación. Se destaca la necesidad de fortalecer el diagnóstico precoz, la vigilancia epidemiológica y la Atención Primaria de Salud.

Descriptores: *Lepra; Epidemiología; Salud Pública; vigilancia epidemiológica.*

INTRODUÇÃO

Leprosy is a chronic infectious disease caused by *Mycobacterium leprae*, which mainly affects the skin and peripheral nerves, and can cause changes in sensitivity, skin lesions, and permanent physical disabilities^{1,2}. Despite advances in diagnosis, its treatment is still associated with social stigmas that contribute to discrimination and hinder timely access to health services.

In this sense, leprosy remains a significant public health problem, especially in low- and middle-income countries, due to its persistence in the population, late diagnosis, and potential to cause physical disabilities. In this scenario, endemicity stands out in countries such as India, Brazil, and Indonesia, with Brazil presenting a high prevalence of the disease^{3,4}.

In this context, from 2014 to 2023, Brazil reported 309,091 cases of leprosy, of which 80% (n= 247,139) were classified as new cases. During this period, a significant reduction in the number of new cases was observed in 2020, possibly related to the impact of the COVID-19 pandemic on health services. In subsequent years, there was a gradual resumption of notifications, maintaining the country in a prominent position in the epidemiological scenario of the disease⁵.

In the state of Ceará, between 2014 and 2024, 16,135 new cases of leprosy were reported, with the presence of areas of high endemicity, especially in inland regions and urban peripheries⁶. The Cariri region, of which the municipality of Iguatu is part, recorded 4,919 cases in the period, evidencing a significant burden of the disease⁷. In 2023, Iguatu was classified as the sixth most hyperendemic city for leprosy in Ceará, with 201 new cases registered in the period from 2015 to 2022⁸.

Despite advances in leprosy control, there are still gaps in knowledge about the epidemiological profile of the disease in local contexts, especially in medium and small-sized municipalities in the interior, which may limit the effectiveness of health surveillance actions.

Therefore, this study is justified by the need to analyze the epidemiological behavior of leprosy in the municipality of Iguatu, contributing to the strengthening of strategies for prevention, early diagnosis and control of the disease.

Thus, the objective was to analyze the epidemiological profile of leprosy in the municipality of Iguatu, located in the south-central region of the state of Ceará, from 2014 to 2024.

MÉTODOS

This is an ecological study, descriptive in nature, with a quantitative approach, about leprosy data in the municipality of Iguatu, Ceará. The data were obtained using the TABWIN/TABNET data tabulation tool, a database linked to the Department of Informatics of the Unified Health System (DATASUS).

The population of this study consisted of records of leprosy cases from the municipality of Iguatu, reported in the National System for Notification of Health

Problems (SINAN), during the period from 2014 to 2024. According to the Brazilian Institute of Geography and Statistics (IBGE), Iguatu is located in the Central-South mesoregion of the state of Ceará, with a population of 98,064 inhabitants, according to the last demographic census of 2022. The municipality is part of the microregion of Cariri in Ceará and is the headquarters of the 18th Decentralized Health Area Coordination (CoADS).

To achieve the proposed objective, the following variables were analyzed: sex, race/color, age group, operational classification and clinical presentation, area of residence, cases in pregnant women, grade of disability, and type of entry and exit. The selection of these variables is justified by the choice of data that are mandatory for notification in SINAN, such as sex, age group, operational classification, and clinical presentation, which are fundamental for the correct characterization of cases. In addition, variables such as race/color, area of residence, cases in pregnant women, and grade of disability are essential for an in-depth epidemiological investigation, as they help to identify patterns and possible inequalities in access to diagnosis and treatment. Finally, the analysis of the type of entry and exit of cases is important to monitor the evolution of patients and the effectiveness of the control strategies adopted.

After collection, the data were tabulated in spreadsheets using Microsoft Office Excel, version 2016. Subsequently, these data were analyzed using descriptive statistics (absolute and relative frequencies) and temporal trend analysis with the aid of JASP. For trend analysis, the Annual Percentage Variation (APC) was calculated from log-linear regression, classifying it as progressive if $p < 0.05$ and positive APC; regressive, if $p < 0.05$ and negative APC; or stationary, if $p > 0.05$.

Because this research used secondary data, freely accessible, where individuals were not identified, there was no need to submit this work to the Research Ethics Committee (CEP). However, it should be noted that all ethical and scientific prerogatives, such as autonomy, non-maleficence, beneficence and justice, were respected, as established by Resolution 466/2012.

RESULTADOS

According to the epidemiological analysis presented in chart 1, the disease is more prevalent in males (60.8%), those who self-identify as brown (71.3%), residents of urban areas (76%), with a predominant age range between 50 and 59 years (19.3%), and with an education level corresponding to incomplete primary education (33.8%).

Chart 1 – Sociodemographic profile of leprosy cases – Iguatu (2014 – 2024)

| Variable | Nº | % |
|-------------------|-----|------|
| Sexo | | |
| Male | 211 | 60.8 |
| Female | 136 | 39.2 |
| Race/color | | |
| White | 61 | 17.8 |

| | | |
|------------------------------|-----|------|
| Brown | 247 | 71.3 |
| Black | 32 | 9.7 |
| Indigenous | 03 | 0.8 |
| Yellow | 01 | 0.2 |
| Ignored/In blank | 03 | 0.2 |
| Zona de residência | | |
| Urban | 264 | 76 |
| Rural | 81 | 23.4 |
| Periurban | 02 | 0.6 |
| Faixa etária de idade | | |
| 5 a 9 years | 08 | 2.4 |
| 10 a 14 years | 09 | 2.5 |
| 15 a 19 years | 06 | 1.7 |
| 20 a 29 years | 29 | 8.4 |
| 30 a 39 years | 45 | 12.9 |
| 40 a 49 years | 62 | 17.8 |
| 50 a 59 years | 67 | 19.3 |
| 60 a 69 years | 64 | 18.4 |
| 70 a 79 years | 43 | 12.3 |
| 80 years or more | 15 | 4.3 |
| Escolaridade | | |
| Illiterate | 47 | 13.5 |
| Incomplete elementary school | 117 | 33.8 |
| Complete elementary school | 33 | 9.6 |
| Incomplete high school | 22 | 6.8 |
| Complete high school | 40 | 11.8 |
| Incomplete college | 05 | 1.5 |
| Complete college | 03 | 1 |
| Ignored/In blank | 76 | 22 |

Fonte: Created by the authors, Iguatu (2026).

Between 2014 and 2024, the municipality of Iguatu reported 347 new cases of leprosy, corresponding to an annual average of 31.5 cases (SD=14.7). The annual distribution of cases is shown in Graph 1, allowing observation of variations throughout the analyzed period.

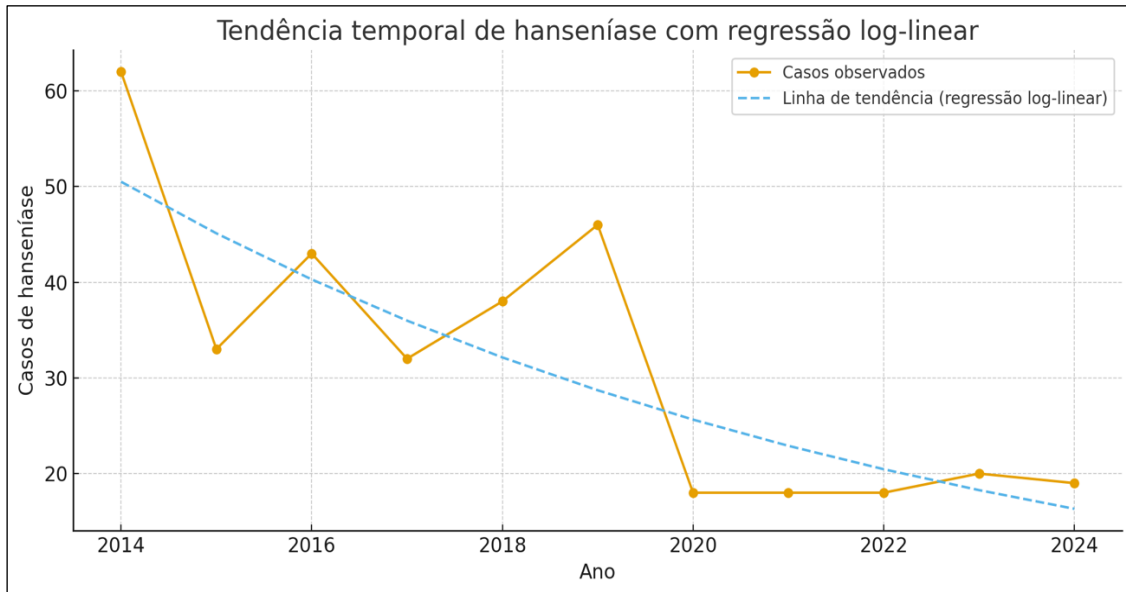
Graph 1 – Number of leprosy cases reported in Iguatu, per year (2014 – 2024)

Figure translation: Title - Temporal trend of leprosy using log-linear regression. - Cases of leprosy - Year. Notes - Observed cases. Trend line (log-linear regression). **Source:** Created by the authors, Iguatu (2026).

Between 2014 and 2024, a decreasing temporal trend was observed in the series of leprosy cases ($APC = -10.68\%$; $p = 0.002$), indicating a statistically significant drop in annual detection. The log-linear model showed a good fit ($R^2 = 0.69$), suggesting a consistent reduction in the evaluated period.

In addition, the analysis of the operational classification at the time of diagnosis showed the predominance of the multibacillary form (77%). Regarding the clinical presentation, the dimorphic form was the most frequent (47.5%), followed by the lepromatous (18.5%) and indeterminate (15%) forms. In relation to the grade of physical disability, the highest proportion of patients with grade zero (62.3%) at the time of diagnosis was observed. Concerning the pregnant variable, most records were classified as not applicable (74%). Regarding the mode of entry, most records were classified as new cases (85%), while the most common mode of exit was cure (78.6%).

Chart 2 – Clinical and operational profile of leprosy cases – Iguatu (2014 – 2024)

| Category | N | % |
|--|-----|------|
| Operational classification in diagnosis | | |
| Multibacillary | 267 | 77 |
| Paucibacillary | 80 | 23 |
| Clinical presentation | | |
| Undetermined | 52 | 15 |
| Tuberculoid | 44 | 12.7 |
| Dimorphic | 165 | 47.5 |
| Virchowian | 64 | 18.5 |
| Not classified | 19 | 5.5 |
| Ignored/In blank | 03 | 0.8 |

| Grade of disability at diagnosis | | |
|---|-----|------|
| Grade Zero | 216 | 62.3 |
| Grade I | 48 | 13.9 |
| Grade II | 12 | 3.5 |
| Not evaluated | 54 | 15.6 |
| Ignored/In blank | 16 | 4.7 |
| Pregnant woman | | |
| 1st quarter | 01 | 0.8 |
| No | 77 | 22.6 |
| Not applicable | 257 | 74 |
| Gestational age unknown | 01 | 0.8 |
| Ignored/In blank | 06 | 1.8 |
| Admission mode | | |
| New case | 295 | 85 |
| Relapse | 27 | 7.8 |
| Trans. Other state | 02 | 0.6 |
| Trans. Same city | 05 | 1.5 |
| Trans. Other city | 05 | 1.4 |
| Other admissions | 13 | 3.7 |
| Type of discharge | | |
| Cure | 273 | 78.6 |
| Abandonment | 18 | 5.2 |
| Death | 06 | 1.8 |
| Trans. Other state | 03 | 0.8 |
| Trans. Same city | 02 | 0.5 |
| Trans. Other city | 09 | 2.7 |
| Wrong diagnosis | 03 | 0.8 |
| Not filled in | 33 | 9.6 |

Fonte: Created by the authors, Iguatu (2026).

DISCUSSÃO

The higher prevalence of cases among males in Iguatu (60.8%) corroborates data from epidemiological bulletins at the state and national levels^{6, 5}. This pattern has been widely described in the literature and can be explained by a combination of social, behavioral, and biological factors. Among these, the lower demand for health services by men stands out, which favors late diagnosis, in addition to greater occupational exposure to risk conditions and less access to health information⁹. Additionally, biological factors, such as the hormonal influence on the immune response to *Mycobacterium leprae*, may contribute to greater susceptibility or more severe clinical evolution¹⁰.

This disease profile is also associated with more unfavorable outcomes, such as a higher frequency of severe clinical forms, increased physical disabilities, a higher rate of treatment abandonment, and a higher occurrence of relapses¹¹. This pattern reinforces the need for specific strategies aimed at the male population. The high proportion of individuals who self-identify as mixed-race, residing in urban areas and with low levels of education, highlights the strong influence of social determinants of health on the occurrence of leprosy in the municipality. This pattern indicates that the disease remains associated with

contexts of social vulnerability, characterized by unfavorable socioeconomic conditions, limited access to information, and difficulties in timely access to health services, factors that favor both exposure and late diagnosis.

The predominance of the mixed-race population corroborates findings from other studies conducted in Brazil, such as in Palmas (Tocantins)¹², and may reflect historically constructed structural inequalities, including structural racism that impacts access to and quality of health care. In this context, leprosy transcends the biological dimension, also configuring itself as a socially determined condition.

Concerning the residential area, the predominance of cases in urban areas may be related to higher population density, which favors the transmission of the disease, as well as the concentration of health services, which may influence the greater detection of cases in these areas. However, studies indicate that, even in urban areas, delays in diagnosis can occur, especially in vulnerable populations, which contributes to maintaining the chain of transmission^{13, 14}.

The low educational attainment observed among affected individuals reinforces this scenario, as it is associated with less understanding of the disease, difficulties in the early recognition of signs and symptoms, and lower adherence to treatment, factors that can contribute to more severe clinical evolution and the development of physical disabilities¹⁵. Thus, these findings highlight the need for intersectoral strategies that consider social inequalities in addressing leprosy.

The temporal analysis of leprosy cases in the municipality shows variations in detection throughout the study period, reflecting not only the dynamics of transmission but also the influence of factors related to the organization of health services. A reduction in the detection of new cases was observed from 2020 onwards, a period that coincides with the beginning of the COVID-19 pandemic.

This decline should not necessarily be interpreted as a real reduction in the incidence of the disease, but possibly as a result of the discontinuity of surveillance, diagnosis, and follow-up actions, due to the reorganization of health services in the face of the pandemic. In this context, prioritizing the fight against COVID-19, reducing in-person care in Primary Health Care, and the absence of professionals may have contributed to the decrease in case detection and the increase in the hidden prevalence of leprosy^{11, 16}.

This scenario reinforces the importance of resuming and strengthening active surveillance and case finding actions in order to reduce diagnostic delays and interrupt the chain of disease transmission in the territory.

The predominance of multibacillary cases (77%) suggests late diagnosis and maintenance of the transmission chain, representing a challenge for disease control. This finding was also observed in a descriptive, retrospective, and cross-sectional study conducted in the state of Ceará, whose objective was to describe the epidemiological profile of leprosy in the state¹⁷.

The higher proportion of multibacillary cases is particularly relevant, since these individuals have a high bacillary load, contributing significantly to the spread of the disease in the community¹¹. This scenario indicates weaknesses in

early detection efforts and reinforces the need to expand strategies for actively searching for cases.

Regarding clinical forms, the most prevalent were the dimorphic and lepromatous forms, reflecting the severity of diagnosed cases, and being associated with more pronounced immune compromise, greater extent of lesions, and a higher risk of neural damage, especially in the hands, feet, and face². These findings suggest that some cases have been identified in more advanced stages of the disease, which may negatively impact the prognosis and quality of life of affected individuals.

The more advanced stages of the disease, identified in this study, are associated with significant impairments in the quality of life of individuals. These impacts go beyond physical manifestations, including functional limitations, pain, changes in sensitivity, and impaired mobility, as well as important psychosocial repercussions, such as stigmatization, social isolation, and emotional suffering¹⁸.

This set of repercussions shows that leprosy is not limited to an infectious disease, but is a condition with important social and psychological implications. In this context, the identification of more severe clinical forms in the municipality reinforces the need for interventions that consider comprehensive patient care, including psychosocial support and strategies aimed at rehabilitation.

Despite the high proportion of multibacillary cases, most individuals presented with zero grade of physical disability at the time of diagnosis (62.3%). The assessment of the grade of disability in leprosy is classified into three levels: grade 0, when there is no sensory loss or deformities; grade 1, characterized by decreased sensitivity or muscle strength, but without deformities; and grade 2, when there is the presence of visible deformities, indicating failures in early detection and delay in diagnosis^{2,5}.

This finding may reflect, on the one hand, the performance of adequate neurological assessment at the time of diagnosis. On the other hand, it may also indicate possible inconsistencies in the recording of information or limitations in the early identification of disabilities, especially in services with less technical capacity. Furthermore, the coexistence of a high proportion of multibacillary cases with a predominance of zero disability grades diverges from findings in the literature, which associate more severe forms of the disease with a higher occurrence of physical disabilities at diagnosis¹⁹.

In this sense, the proper assessment of the degree of disability is fundamental for planning measures and implementing actions aimed at preventing serious sequelae of the disease, as well as for monitoring clinical evolution²⁰.

Regarding the pregnant variable, a high proportion of records classified as "not applicable" was observed, which is due to the inclusion of this variable in the entire sample during the database organization stage, without restriction by sex. This procedure limits the interpretation of the results, since this condition is only relevant to a specific segment of the population.

Therefore, the analysis of this variable should be interpreted with caution, and its evaluation should be more appropriately restricted to the female population of childbearing age. The inclusion of this variable in the total set may introduce biases and compromise analytical validity, especially in the absence of appropriate stratification.

However, despite this limitation, the literature indicates that leprosy during pregnancy is a challenge for health services, since physiological changes can hinder diagnosis and increase the risk of leprosy reactions and relapses^{21,22}. In this context, the importance of specific approaches and qualification of care aimed at this group is reinforced.

According to the literature, the high percentage of cases classified as new evidences the continuity of the leprosy transmission chain in the territory, reinforcing the importance of active epidemiological surveillance. In addition, this data may reflect the capacity of health services to identify and report cases, especially Primary Health Care. On the other hand, it also suggests the influence of social determinants, such as unfavorable socioeconomic conditions, difficulties in accessing health services, and the stigmatization of the disease^{23,24}.

Finally, the outcome of cure, as pointed out in the literature, is considered a positive finding in the treatment of leprosy, as it represents a crucial indicator of the effectiveness of the treatment and reflects the success of therapeutic and diagnostic strategies, as well as the quality of health services, in addition to reflecting patient adherence to treatment. However, it is crucial to maintain continuous surveillance to detect gaps in treatment, such as abandonment, relapse, and underreporting²⁵.

This study has limitations inherent to the use of secondary data from SINAN, being subject to underreporting, inconsistencies, and incompleteness of information. Furthermore, since it is an ecological study, it is not possible to establish causal relationships between the variables analyzed, and there are possibilities of ecological fallacy. It should also be noted that the analysis, restricted to a single municipality, limits the generalization of the findings to other epidemiological realities, and may be influenced by local factors, including possible impacts of the COVID-19 pandemic on the detection and notification of cases.

Despite these limitations, the study contributes to understanding the epidemiological profile of leprosy at the local level, providing relevant subsidies for the planning of health actions and strengthening surveillance strategies. Additionally, the findings can guide future investigations, especially regarding the evaluation of new diagnostic strategies and interventions aimed at early diagnosis and interruption of the transmission chain.

CONCLUSÃO

This study characterized the epidemiological profile of leprosy in the municipality of Iguatu, highlighting a higher occurrence among men, self-declared brown-skinned individuals, residents of urban areas, and those with low

levels of education. This reinforces the influence of social determinants on the disease process and access to health services.

A predominance of multibacillary cases and more advanced clinical forms was observed, suggesting late diagnosis and possible maintenance of the transmission chain in the municipality, despite the decreasing temporal trend identified during the analyzed period. On the other hand, the high cure rate indicates the effectiveness of the implemented therapeutic strategies.

The findings contribute to the understanding of leprosy in a local context, especially in medium-sized municipalities in the interior, reinforcing the need to strengthen epidemiological surveillance actions, with an emphasis on early detection, active case finding, and continuous monitoring of patients within the scope of Primary Health Care.

Future studies are recommended to further analyze the factors associated with the occurrence of leprosy in the local context, as well as to evaluate the effectiveness of the control strategies adopted, aiming at reducing transmission and physical disabilities related to the disease.

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