Leprosy cases in Pernambuco between 2013 and 2022: An epidemiological study

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ABSTRACT

Introduction: Leprosy is an infectious disease caused by the bacterium *Mycobacterium leprae. This condition persists as a relevant public health problem, occupying the second place in the world ranking of morbidity, being one of the most important neglected diseases for study. Objective: To analyze the* epidemiological profile of leprosy cases reported in the state of Pernambuco from 2013 to 2022. Methods: This is a cross-sectional epidemiological study conducted in Pernambuco, Brazil, using data from the SINAN and IBGE databases. The annual detection rate, absolute (n) and relative (%) frequencies of the variables sex, race/color, age group, education, clinical form of notification, assessment of inability to cure and sputum smear microscopy were calculated, with a statistical significance level of 5% ($p<0.05$). The data were analyzed using Microsoft Excel 2019® and the R 4.0.2 software. Results: A total of 28,109 cases were reported, with a detection rate of 28.65 cases/100,000 inhabitants. Most cases occurred in males (51.71%); brown race/color (58.22%); age group 40-59 years (37.59%); and incomplete elementary school (34.99%). The predominant clinical form was dimorphic (38.84%). In the assessment of inability to cure, the category "unknown/blank" was the most prevalent (45.27%), followed by Grade Zero (37.16%); Sputum smear microscopy was not

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performed in 34.91%. Conclusion: The results of this study are important, because although there is a trend of decrease in leprosy cases in the period, some years there were peaks of increase. This highlights the need to strengthen health surveillance actions and implement effective public policies to combat this disease.

Keywords: Leprosy, Public Health, Epidemiology.

INTRODUCTION

Leprosy is characterized by being an infectious disease, caused by the bacterium *Mycobacterium leprae,* manifesting itself in the skin mucosa and peripheral nerves, resulting in physical disabilities and deformities (Silva et al., 2023). Despite the reduction of the disease after the introduction of multidrug therapy (MDT), this condition still persists as a relevant public health problem, occupying the second place in the world ranking of morbidity. Leprosy continues to be one of the most important neglected diseases to be studied (Barros et al., 2024).

The World Health Organization (WHO) reported 140,594 new cases of leprosy worldwide in 2021, with the majority of cases recorded in India, followed by Brazil and Indonesia (WHO, 2021). In Brazil, leprosy has been a challenge for several decades, with poverty and social vulnerability being factors that contribute to inequality and proliferation of the disease (Ribeiro et al., 2022).

Leprosy is considered a notifiable disease and mandatory investigation. Brazil ranks second in the absolute numbers of leprosy cases, with about 30 thousand people diagnosed annually, second only to India (BRASIL, 2023). In 2022, Brazil recorded 26,436 cases of the disease, with a detection rate of 13.01 cases/100,000 inhabitants, considered to be highly endemiistic (Brasil, 2024; Brito, et al., 2015). The state of Pernambuco, located in the Northeast region, was responsible for 2,494 of the cases, with a detection rate of 25.61 cases/100,000 inhabitants (Brasil, 2024).

Leprosy generates high costs for the Unified Health System (SUS), with hospitalizations, treatment and rehabilitation, in addition to being accompanied by a strong social stigma. This entails several clinical and social challenges for the affected individual, from acceptance of the disease to adherence to treatment (Ribeiro et al., 2022). Thus, the objective of the study is to analyze the epidemiological profile of leprosy cases reported in the state of Pernambuco in the period from 2013 to 2022.

The period from 2013 to 2022 was chosen to analyze leprosy in Pernambuco due to the implementation of several public policies and strategies to control and prevent the disease. This interval allows us to assess the effectiveness of these interventions over time and to identify trends and changes in epidemiological patterns. The results may provide valuable information for the formulation of future policies and strategies for leprosy control, both in Pernambuco and in other endemic regions.

METHODOLOGY

This is a cross-sectional epidemiological study. The study location is the state of Pernambuco, in the Northeast of Brazil, with a territorial extension of 98,067,877 km2 and a population of 9,058,931 people, with a demographic density of 92.37 inhabitants/km2 (IBGE, 2022). Pernambuco is made up of 184 municipalities and the island of Fernando de Noronha, composed of 12 health

regions and four macro-regions (Metropolitan, Agreste, Sertão and Vale do São Francisco and Araripe (PERNAMBUCO, 2012).

The study population consists of all new cases of leprosy, residing in the state of Pernambuco, notified in the period from 2013 to 2022. The following databases were used: Diseases and Notification Information System (SINAN), the Department of Informatics of the Brazilian Unified Health System (DataSUS) and the Brazilian Institute of Geography and Statistics (IBGE) for population estimates.

To characterize the epidemiological profile of leprosy cases, the detection rate for each year analyzed was calculated, obtained from the following formula: Detection rate=

$$\frac{Casos\ novos\ de\ hanseníase\ notificados\ em\ PE\ no\ ano}{População\ total\ de\ PE\ no\ ano} * 100.000$$

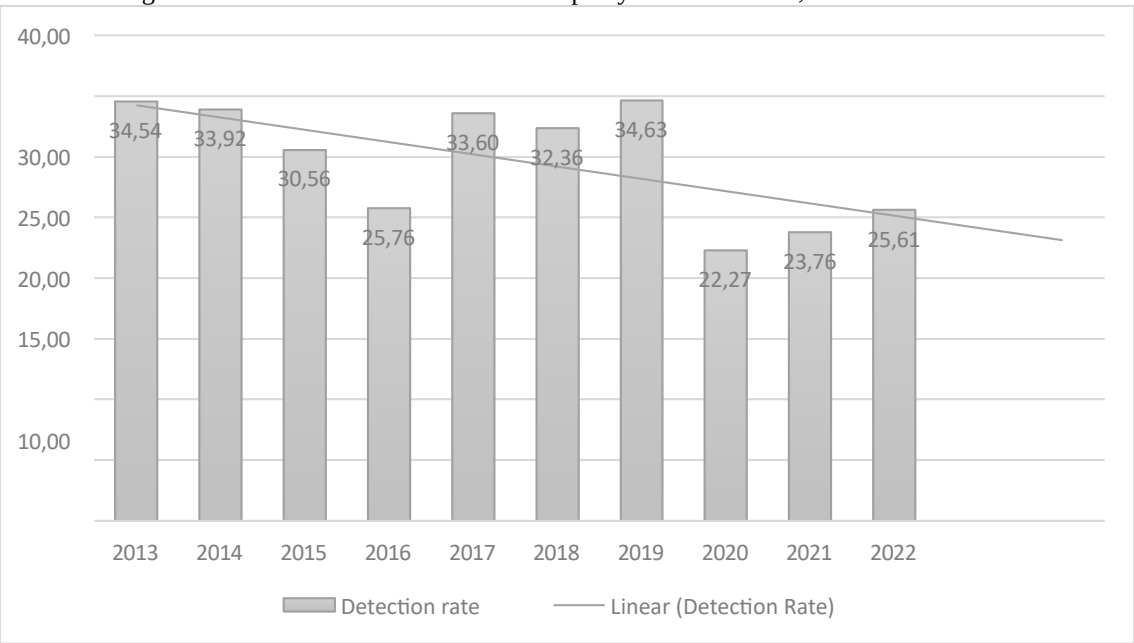
In the statistical analysis, the absolute (n) and relative (%) frequencies of the variables sex, race/color, age group, education, clinical form of notification, assessment of inability to cure, and sputum smear microscopy were calculated. For all the tests performed, a statistical significance of 5% ($p<0.05$) was adopted. The data were analyzed using Microsoft Excel 2019® spreadsheets and the R 4.0.2 software.

Regarding the approval of the Research Ethics Committee, the study did not need to use data in the public domain, according to Resolution No. 466/2012 of the National Health Council, dispensing with submission to the ethics committee (BRASIL, 2012).

RESULT

In Pernambuco, between 2013 and 2022, 28,109 new cases of leprosy were reported. There was a downward trend in the detection rate in 2013, 2014, 2015 and 2016. An upward trend was observed in the following years in 2017, 2018 and 2019, returning to a downward trend in 2020, 2021 and 2022. In addition, it was observed that the year 2019 stood out with the highest detection rate (34.63/100 thousand inhabitants) and the year 2020 with the lowest (22.27/100 thousand inhabitants) (Figure 1).

Figure 1: Detection rate of new cases of leprosy in Pernambuco, from 2013 to 2022.



Source: Prepared by the author. Data extracted from the System of Diseases and Notifications (SINAN), 2024.

Between 2013 and 2022, 28,109 cases of leprosy residing in the state of Pernambuco were reported, resulting in a detection rate of 28.65 cases/100 thousand inhabitants. Of these, 14,791 were reported in the first five years (2013-2017), with a rate of 31.66 cases/100 thousand inhabitants. In the second five-year period (2018-2022), 13,318 cases were reported, with a rate of 27.70 cases/100 thousand inhabitants (Table 1).

Regarding the epidemiological profile of the total period, it was observed that most cases occurred in males (51.71%); of brown race/color (58.22%), followed by white (18.72%); in the 40-59 age group (37.59%); with incomplete elementary school education (34.99%); The clinical form of notification was dimorphic (38.84%). In the evaluation of the inability to cure, the unknown/blank category had the highest predominance (45.27%), followed by Grade Zero (37.16%); sputum smear microscopy was not performed in (34.91%) of the cases (Table 1).

When comparing the five-year periods individually, he observed a profile similar to the one previously described. However, in relation to the percentage variation of the absolute numbers, it was found that some points stood out, such as the increase in cases in indigenous people (55.56%); in the age group from 1 to 9 years, there was a reduction of 54.96%; and in schooling, there was an increase of 76.85% in complete higher education. In the clinical form of notification, tuberculoid disease showed a reduction of 50.59%. In addition, it was observed that in the evaluation of the inability to cure, the blank category showed an increase of 40.82%, and the sputum smear microscopy also showed an increase of 362.93% in the unknown/blank variable (Table 1).

Table 1 – Characterization of leprosy cases reported in the state of Pernambuco in the years 2013 to 2022, according to the year of notification.

Variables/ Categories	(2013-2017)		(2018-2022)		Total		D%*	X2; p** value
	N	%	N	%	N	%		
Sex								
Male	7516	50,81	7019	52,70	14535	51,71	-6,61%	
Female	7274	49,18	6297	47,28	13571	48,28	-13,43%	10,5; <0,005
Ignored	1	0,01	2	0,02	3	0,01	100,00%	
Race/color								
White	2767	18,71	2495	18,73	5262	18,72	-9,83%	
Black	1943	13,14	1838	13,80	3781	13,45	-5,40%	
Yellow	111	0,75	90	0,68	201	0,72	-18,92%	16,23; <0,006
Brown	8710	58,89	7656	57,49	16366	58,22	-12,10%	
Indigenous	45	0,30	70	0,53	115	0,41	55,56%	
Ign/Branco	1215	8,21	1169	8,78	2384	8,48	-3,79%	
Age group								
1-9 years	575	3,89	259	1,94	834	2,97	-54,96%	
10-19 years	1552	10,49	1024	7,69	2576	9,16	-34,02%	
20-39 years	4419	29,88	3387	25,43	7806	27,77	-23,35%	302,6; <0,01
40-59 years old	5254	35,52	5368	40,31	10622	37,79	2,17%	
60 years and over	2991	20,22	3280	24,63	6271	22,31	9,66%	
Schooling								
Illiterate	1220	8,25	877	6,59	2097	7,46	-28,11%	
Incomplete elementary school	5737	38,79	4099	30,78	9836	34,99	-28,55%	
Complete elementary school	626	4,23	558	4,19	1184	4,21	-10,86%	
Incomplete high school	760	5,14	662	4,97	1422	5,06	-12,89%	
Complete high school	1469	9,93	1558	11,70	3027	10,77	6,06%	347,3; <0,01
Incomplete higher education	129	0,87	178	1,34	307	1,09	37,98%	
Complete higher education	298	2,01	527	3,96	825	2,94	76,85%	
Not Applicable/Ignored	4552	30,78	4859	36,48	9411	33,48	6,74%	
Clinical Form of Notification								
Undetermined	2837	19,18	1835	13,78	4672	16,62	-35,32%	
Tuberculoid	2951	19,95	1458	10,95	4409	15,69	-50,59%	
Dimorphic	5080	34,35	5838	43,84	10918	38,84	14,92%	823,8; <0,01
Virchowiana	2222	15,02	1868	14,03	4090	14,55	-15,93%	
Unclassified	1096	7,41	1501	11,27	2597	9,24	36,95%	
Ign/Branco	605	4,09	818	6,14	1423	5,06	35,21%	
Assessment of Healing Inability								
Grade Zero	6756	45,68	3688	27,69	10444	37,16	-45,41%	
Grade I	1171	7,92	805	6,04	1976	7,03	-31,26%	
Grade II	398	2,69	349	2,62	747	2,66	-12,31%	1274; <0,01
Not rated	1182	7,99	1035	7,77	2217	7,89	-12,44%	
Blank	5284	35,72	7441	55,87	12725	45,27	40,82%	

Smear Smear								
Positive	2730	18,46	998	7,49	3728	13,26	-63,44%	
Negative	3786	25,60	1353	10,16	5139	18,28	-64,26%	6987; <0,01
Not realized	6600	44,62	3213	24,13	9813	34,91	-51,32%	
Ignored/blank	1675	11,32	7754	58,22	9429	33,54	362,93%	

Source: Prepared by the author, 2024. Data extracted from the System of Diseases and Notifications (SINAN) 2024.*Percentage change between the five-year periods (2013-2017) and (2018-2022). **Chi-Square Test.

DISCUSSION

The findings of the present study demonstrate a decrease in leprosy cases in the total study period in the state of Pernambuco. However, despite this decrease, growth peaks were observed in certain years, as well as disparities in the variables sex, race/color, age group, education, clinical form of notification, assessment of inability to cure, and sputum smear microscopy.

The downward trend in the leprosy detection rate in the state, especially in the first five years (2013-2016), is in line with the country's literature and may be related to the implementation of the National Leprosy Control Program in Brazil and the strengthening of disease control in Primary Health Care (PHC) (Anchieta Jefferson de Jesus et al., 2019; Lopes, Fernanda de Castro et al., 2021). From 2020 onwards, a reduction in cases was observed, possibly associated with the context of the Covid-19 pandemic, due to the interruption of prevention, diagnosis, and treatment actions with social distancing measures and access restriction in PHC.

In that same year, there was a significant reduction of 37.1% in the detection of new cases in the world compared to 2019, as a consequence of the Coronavirus health crisis, strongly impacting the diagnosis and treatment of chronic comorbidities (WHO, 2021). Brazilian research (Lima, Lucas Vinícius et al., 2021) shows that there was a drastic reduction in the notification of cases in much of the country in 2020 and 2021, due to the fragility of access to health, the population's fear of seeking care, and the increase in morbidity and mortality, culminating in the care overload of the three levels of care (Mendes, Eugênio Vilaça, 2020).

Teófilo (2014) in his analyses, concludes that all regions of Brazil showed an increase in the average detection rate in the indigenous population, with the Northeast being the most endemic region and with the highest rate, surpassing the country's average. The high detection rates among these peoples are associated with historical isolation; these communities face difficulties in accessing medical care due to the distance from hospital centers and the logistical complexities of the displacement of health professionals (Barros, Ian da Costa Araújo et al., 2024).

Regarding sociodemographic variables, the predominance of cases in males suggests behavioral factors and cultural difficulties in health care for this population. Research reinforces that men, compared to women, tend to seek health services less, influenced by masculinity as a restrictive

factor, which makes it difficult to adopt self-care practices. In this context, seeking health services is often associated with weakness, fear and insecurity (Gomes, Romeu et al., 2007).

In addition, the development of leprosy among this population group usually involves more severe clinical manifestations, greater physical disabilities, high rates of treatment abandonment, and higher mortality (Souza, Eliana Amorim et al., 2018). However, other studies highlight that differences in the response to infection are more associated with physiological than behavioral risk factors, which can be explained by hormonal changes in adolescence, such as estrogen and testosterone levels, which create a favorable environment for the growth of *M. leprae* and result in a higher bacillary load in men (Nobre, Mauricio Lisboa et al., 2017; Guerra-Silveira, Felipe Abad-Franch, Fernando, 2013).

With regard to the age group, the data are similar to those of other studies, in which the economic, social and psychological losses for the patient, his family and society are highlighted. This is because leprosy can cause physical disability, compromising the ability to work and affecting the economically active age group (Araújo, Daniella Azevedo Lobo et al., 2016; Véras, Gerlane Cristinne Bertino et al., 2023). A study conducted by Ribeiro and Gabriela de Cássia (2012) to assess factors associated with physical disability highlighted that 46.5% of the interviewees were out of the labor market, of which 33.3% were away from their work activities due to complications resulting from leprosy. Although the adult age group of 40 to 59 years is the majority in this study, there is a concern about the increase in cases in young people aged 10 to 19 years, considering that the clinical signs of the disease are not easily recognized in childhood, requiring a careful diagnosis. In addition, the social and physical problems and stigmas associated with the disease, which affect the mental health of patients, cannot be neglected (Pires, Carla Andrea A et al., 2012; Ferreira, Isaias Nery; Alvarez, Rosicler Rocha Aiza, 2005).

Other studies point out that racial inequalities reflect health consequences, with the worst indicators observed in brown and black populations, in addition to higher prevalence of chronic diseases in black people when compared to white people (Malta, Débora Carvalho et al., 2015). the transmission of the infectious agent and the increase in cases of the disease, considering the sanitary conditions, precarious social and economic aspects (Barbosa, Débora RM et al., 2014).

Regarding the clinical form of the disease, studies converge with the findings of this study, highlighting a statistical and quantitative superiority of patients classified as Borderline and Virchowian form, suggesting a late diagnosis (Silva, Sobrinho RAS et al., 2009; Lima, HMN et al., 2014). Most individuals did not present physical disability at diagnosis (37.16%), having been classified as Disability Grade 0, which differs from what has been reported in the literature. However, there was a predominance of ignored data in this variable, which may have impaired the analysis. Sputum smear microscopy was not performed in 34.91% of the cases, which neglects the

diagnosis, since it is a quick, low-cost, minimally invasive laboratory procedure and has good accuracy for classifying the clinical form of the disease (Buhrer-Sékula S, 2008).

As limitations of this study, the use of secondary data from information systems stands out, which may present inconsistencies in terms of quantity, quality and processing of information. In addition, the amount of ignored data can compromise the accuracy and integrity of the analyses, affecting the reality of the epidemiological profile of the disease. This can hinder the identification of risk groups and the implementation of more precise interventions.

It is also necessary to emphasize the difficulties in diagnosis and the underreporting of new cases of the disease, which are associated with the weaknesses of health surveillance systems and the lack of adequate professional qualification (Sánchez, Mauro Niskier et al., 2021).

Finally, the results of this study are important, because although it shows a trend of decrease in leprosy cases in the period from 2013 to 2022, some years there were peaks of increase. Furthermore, this study revealed that the cases in the state of Pernambuco have established population groups such as men, brown people, individuals aged 40 to 59 years and with incomplete elementary education. These findings highlight the urgent need to strengthen health surveillance actions and implement effective public policies to address this problem.

In addition, the results are in accordance with the existing literature and can offer *valuable insights* for decision-making regarding leprosy control strategies and coping with the disease in the state. It is essential that further research be conducted to deepen the understanding of the conditioning and determining factors of leprosy, as well as to investigate the possible variations in the detection coefficients of leprosy in Pernambuco.

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