Original Research Article

Socio-Demographic and clinical profile of leprosy in the Regions of Brazil and outcome of new cases between 2012 and 2022

ABSTRACT

Aims: This study aims to determine the sociodemographic and clinical profile of new leprosy cases in Brazil between 2012 and 2022.
Study design: To build the sociodemographic and clinical profile of leprosy in the regions of Brazil and the evolution of new cases between 2012 and 2022
Place and Duration of Study: The study was carried out in Brazil from 2012 to 2022, using real-world data from epidemiological surveillance.
Methodology: This is an ecological, quantitative, analytical and cross-sectional study. Ecological study research compares the occurrence of the disease/health-related condition and the exposure of interest among aggregates of individuals (populations of countries, regions or municipalities, for example) in order to verify the possible existence of an association between them.
Results: The heterogeneity of new cases of the disease was observed, with significant variations between the regions investigated. There was a predominance in all regions of multibacillary cases in men (44.12%), aged between 20 and 59 years (65.08%), brown individuals, the latter, however, with a higher incidence in the North and Northeast regions. There was a predominance of grade zero disability (57%), although there were significant figures for grades I (23.61%) and II (7.55%) between the regions. With regard to the type of outcome, in all regions there were significant figures for cure (73.46%). The rates of death and misdiagnosis were relatively low, but there was a high dropout rate, especially for the multibacillary form (80.78%).
Conclusion: In addition, the low level of schooling was shown to be a factor related to the different proportions of operational forms of leprosy cases between the five regions, especially the poorest and those with the highest incidence.

Keywords: Leprosy; Operational form; Epidemiology.

1. INTRODUCTION

Leprosy is an infectious and contagious disease caused by the alcohol- and acid-resistant bacillus known as *Mycobacterium leprae* (M.leprae), whose microorganism invades the peripheral nerves, with a predilection for Schwann cells [1]. To simplify and improve the direction of treatment, the World Health Organization (WHO) has adopted an operational classification according to the number of skin lesions that differentiates the forms of the disease, where patients with up to 5 lesions are classified as Paucibacillary and Multibacillary for 6 or more lesions [2] [3].

In addition, other classification nomenclatures based on the clinical aspects of the disease are used to differentiate it, including the indeterminate, tuberculoid, dimorphic and virchowian forms [1]. Infection occurs through direct and prolonged person-to-person contact, eliminating the bacillus in its active multibacillary form. Transmission occurs via the upper airways and requires a host susceptible to *M. leprae* [4]. Although this disease is curable, it still remains a major health challenge in several developing countries [5].

According to the World Health Organization, in 2021, 140,594 new cases of leprosy were reported globally, in 2022 these cases increased to 174,087, equivalent to a detection rate of 21.8 per million inhabitants, representing an increase of 23.8% compared to 2021. The Asian continent was the region with the most reported cases, with 71.4%, followed by the African continent with 12.6%, the Americas with 12.3% and Europe with <1% of reported cases [6].

In the Brazilian context, the Leprosy Control Program, created in 2010 by the Ministry of Health, strengthened Primary Health Care (PHC) services, where it directed greater transfers of funds and improved health service access strategies, increasing vaccination coverage, early diagnosis of the disease and monitoring of contacts, with the aim of curbing and controlling this disease [7]. However, this pathology is still endemic in the country, with 77.6% of new cases, 9.1% re-entry, 7.9% transfer and 5.0% recurrence in 2022 [8].

Leprosy is strongly linked to social and economic factors, where it is concentrated in regions with low purchasing power [9]. In addition, the clinical course of this disease, when left untreated, causes lesions, deformities and functional incapacity, which trigger prejudice, feelings of exclusion and stigmas that directly influence homogeneous coexistence in society [10]. In view of this, the aim of this study is to outline the sociodemographic and clinical profile of the operational classifications of new leprosy cases and the outcome of these cases in the regions of Brazil between 2012 and 2022.

2. METHODOLOGY

This is an ecological, quantitative, analytical and cross-sectional study. Ecological study research compares the occurrence of the disease/health-related condition and the exposure of interest among aggregates of individuals (populations of countries, regions or municipalities, for example) in order to verify the possible existence of an association between them. In a typical ecological study, aggregate measures of exposure and disease are compared [11]. Quantitative research is a quantitative approach that uses data collection, translating its results into numbers [12]. The analytical type of research seeks to identify determinants that contribute to the occurrence of events [13]. The cross-sectional

design involves collecting data at a specific time to confirm whether or not the events being investigated were confirmed [14].

The study was carried out in Brazil from 2012 to 2022, using real-world data from epidemiological surveillance. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline for observational studies. Brazil has a territorial extension of 8,515,767.049 km², where its estimated population is 213.3 million inhabitants [15].

The clinical and epidemiological data on new cases of leprosy were collected from the database of the Information Technology Department of the Unified Health System (DataSUS-TABNET), on the platform of the Notifiable Diseases Information System (SINAN), available from 2012 to 2022. The following variables available in SINAN were analyzed: gender, age group, education level, race, degree of disability and types of exit of new leprosy cases between 2012 and 2022. The BioEstat software, version 5.0, was used for inferential statistical analysis, where the Chi-Square test was applied by Contingency Table of independent samples to test the association between the different categories of a variable in independent groups, considering a statistical significance level of $p<0.05$.

As this is a study using public secondary data (DATASUS-SINAN), it was not submitted to the Research Ethics Committee, in compliance with National Health Council Resolution No. 466 of December 12, 2012, and does not require the signing of an Informed Consent Form (ICF).

3. RESULTS AND DISCUSSION

Table 1 shows the operational classification of new leprosy cases in the northern region of the country between 2012 and 2022, categorizing them as paucibacillary or multibacillary, in relation to different sociodemographic and clinical variables. The values were significant for all the variables analyzed in this region. In terms of gender, 26,299 (78%) of the men were classified as multibacillary, while 7,234 (22%) were considered paucibacillary. Among women, the proportion of multibacillary cases was 14,204 (62%), while 8,530 (38%) of the patients were paucibacillary. The higher incidence among men can be explained by the lower level of health care provided by this population group. With regard to race, the highest proportion of multibacillary cases was observed in the yellow population, with 665 (80%) of the cases classified as multibacillary and 168 (20%) as paucibacillary. The black and brown populations also had a high prevalence of multibacillary cases, with 4,572 (74%) and 2,828 (72%) of the cases, respectively, adding black and brown together, they

were the races most affected by the disease, which can be explained by the precarious socio-economic factors and social vulnerability concentrated in this population.

The age group showed that the proportion of multibacillary cases among patients aged 60 and over, 8,449 (83%) were classified as multibacillary, compared to 1773 (17%) who were paucibacillary. Among the younger patients, aged between 0 and 19, 3591 (42%) were paucibacillary, while 4860 (58%) were considered multibacillary. What may corroborate this narrative is the factor related to the decline of the immune system and consequently greater involvement in associated pathologies. With regard to schooling, it was observed that illiterate patients had the highest proportion of multibacillary cases, with 4004 (84%) of the cases in this category. Similarly, among those with incomplete primary education, 18816 (72%) were classified as multibacillary. On the other hand, patients with incomplete or complete higher education had lower proportions of multibacillary cases, 525 (61%) and 1102 (65%), respectively, corroborating the influence of socioeconomic factors on the disease. As a result, it is worth highlighting the lack of active search for patients' contacts, knowing that the lack of diagnosis delays treatment, thus causing medium- to long-term complications.

When analyzing the degree of disability, it was found that 13086 (90%) of the patients with grade I disability and 4057 (95%) of those with grade II were classified as multibacillary, indicating a strong association between the increased degree of disability and the multibacillary form of the disease. Regarding the type of treatment outcome, cure was achieved by 29072 (69%) of the multibacillary patients, while among the paucibacillary patients, this proportion was 12964 (31%). The death rate was also higher among multibacillary patients at 683 (94%), compared to 47 (6%) among paucibacillary patients. It is therefore worth highlighting the lack of active search for patients' contacts, knowing that the lack of diagnosis delays treatment, thus causing medium- to long-term complications.

Table 1. Sociodemographic and clinical profile of patients affected by paucibacillary and multibacillary leprosy in the north of the country between 2012 and 2022.

Variables	**Paucibacillary**		**Multibacillary**		
Sex	**N**	**%**	**N**	**%**	**P- value**
Masculine	7234	22	26299	78	**<0,0001***
Feminine	8530	38	14204	62	
Race					
Ignored	288	28	731	72	**<0,0001***
White	2298	28	5951	72	
Black	1646	26	4572	74	
Yellow	168	20	665	80	

Brown	11193	28	28228	72	
Indigenous	172	32	358	68	
Age Range					
0 - 19 years	3591	42	4860	58	
20 - 39 years	5821	31	12807	69	**<0,0001***
40 - 59 years	4580	24	14389	76	
60 and over	1773	17	8449	83	
Education					
Ign/White	1981	25	5840	75	
Illiterate	735	16	4004	84	
Incomplete elementary education	7221	28	18816	72	
Complete elementary education	888	28	2280	72	**<0,0001***
Incomplete high school	1255	32	2695	68	
Complete high school	2522	34	4968	66	
Incomplete higher education	333	39	525	61	
Complete higher education	604	35	1102	65	
Not applicable	226	56	175	44	
Degree of Disability					
Blank	412	28	1071	72	
Degree zero	13070	39	20538	61	
Degree I	1403	10	13086	90	**<0,0001***
Degree II	192	5	4057	95	
Not assessed	688	28	1753	72	
Type of Exit					
Not filled	587	15	3397	85	
Cure	12964	31	29072	69	
Transfer	976	16	5157	84	**<0,0001***
Death	47	6	683	94	
Abandonment	907	25	2675	75	
Diagnostic error	284	36	497	64	

Qui-quadrado test.;*: There was a significant difference between different groups studied by the chi-square test. Source: SINAN/ DATASUS.

Table 2 shows significant values for all the variables analyzed for new cases in the northeast of the country during the period studied. In the gender variable, 53,719 (77%) of the men were classified as multibacillary, while 15,982 (23%) were paucibacillary. Among women, 33,039 (56%) presented as multibacillary and 25,568 (44%) as paucibacillary. This corroborates all the literature, in which men are more affected by the disease, and one of the justifications is still the fact that they find it difficult to seek Primary Health Care (PHC).

Regarding race, the highest proportion of multibacillary cases was observed among black individuals, with 12,113 (70%) in this category, while 5,136 (30%) were paucibacillary. The brown population also had a high prevalence of multibacillary cases, with 55,390 (68%) multibacillary, in contrast to 26,155 (32%) paucibacillary, which still reflects the inequality in Brazil, with a less privileged population affected by acute and chronic diseases.

Looking at the age group, individuals aged 60 and over had the highest proportion of multibacillary cases, with 24,888 (77%), in contrast to 7,617 (23%) of paucibacillary cases. Younger patients, aged between 0 and 19, had a more even distribution, with 8,104 (52%) multibacillary and 7,428 (48%) paucibacillary. Despite the elderly population in this study being the largest percentage affected by the disease, recent comparative studies talk about the increase in the population, but young, affecting the economically active population, that is, those most exposed to the disease, and on the other hand the elderly, with a declining immune system.

In terms of schooling, illiterate people stood out with 11,807 (81%) of multibacillary cases and 2,728 (19%) of paucibacillary cases. Patients with complete and incomplete higher education also showed a significant distribution, with 1,790 (52%) and 827 (53%) of multibacillary cases, respectively. This corroborates the IBGE census, of which, in the historical average for the years 2010 to 2022, the northeastern states maintain a high rate of illiteracy among the population that cannot read and write, and a poorly educated population is inversely proportional to the improvement in the cure of the disease in question.

As for the degree of disability, patients with Grade II were significant among multibacillary cases, reaching 7,860 (94%), while only 518 (6%) were paucibacillary. Grade I was also significant, with 21,293 (85%) of the patients being multibacillary. With regard to the type of outcome, cure was achieved by 61,846 (64%) of the multibacillary patients and by 34,287 (36%) of the paucibacillary patients. The death rate was higher among multibacillary patients, at 1,931 (91%), compared to 190 (9%) of paucibacillary patients. In question, the data related to the Northeast highlights the outcomes of the degree of disability, as well as cure, abandonment and death, given that the sociodemographic classes are those that have a negative impact, such as social and socioeconomic vulnerabilities.

Table 2. Sociodemographic and clinical profile of patients affected by paucibacillary and multibacillary leprosy in the northeast of the country between 2012 and 2022.

Variables	**Paucibacillary**		**Multibacillary**		
Sex	**N**	**%**	**N**	**%**	**P-valor**
Masculine	15982	23	53719	77	**<0,0001***
Feminine	25568	43	33039	56	

Race					
Ignored	2400	36	4334	64	
White	7332	34	13931	66	
Black	5136	30	12113	70	**<0,0001***
Yellow	389	35	722	65	
Brown	26155	32	55390	68	
Indigenous	141	34	274	66	
Age Range					
0 - 19 years	7428	48	8104	52	
20 - 39 years	11943	35	22478	65	**<0,0001***
40 - 59 years	14565	32	31292	68	
60 and over	7617	23	24888	77	
Education					
Ign/White	8958	32	18862	68	
Illiterate	2728	19	11807	81	
Incomplete elementary education	15992	31	35348	69	
Complete elementary education	2182	35	4140	65	
Incomplete high school	2800	39	4400	61	**<0,0001***
Complete high school	5707	38	9125	62	
Incomplete higher education	722	47	827	53	
Complete higher education	1660	48	1790	52	
Not applicable	804	63	465	37	
Degree of Disability					
Blank	2257	29	5487	81	
Degree zero	31654	42	43057	68	
Degree I	3879	15	21293	85	**<0,0001***
Degree II	518	6	7860	94	
Not assessed	3245	26	9067	74	
Type of Exit					
Not filled	2253	19	9808	81	
Cure	34287	36	61846	64	
Transfer	2097	23	7022	77	**<0,0001***
Death	190	9	1931	91	
Abandonment	2109	29	5141	71	
Diagnostic error	617	38	1016	62	

Qui-quadrado test.;*: There was a significant difference between different groups studied by the chi-square test. Source: SINAN/ DATASUS.

Table 3 shows the numbers of new cases distributed between the sociodemographic profiles and the classification of the disease in the southeast region between 2012 and 2022. With regard to males, 18,615 (77%) of the new cases were diagnosed as multibacillary, while 5,593 (23%) were paucibacillary. Among women, 11,288 (59%) were classified as multibacillary, while 7,891 (41%) as paucibacillary. These values were significant at P (<0.0001).

Considering race, there was no significant difference, however, the highest proportion of multibacillary cases was observed among individuals of white race/color, with considerable numbers of multibacillary cases, with 12,734 (69%) in this category, in contrast to 5,621 (31%) of paucibacillary cases. However, the brown race/color is still the race that the population most often self-declares; Table 3 shows the brown race in second place in terms of color/race.

There was a significant difference between the age groups, with individuals aged 60 and over showing a significant number of multibacillary cases, with 9,593 (76%), while 3,084 (24%) were paucibacillary. The youngest age group, from 0 to 19, showed an inverse distribution, with 1,723 (53%) paucibacillary and 1,506 (47%) multibacillary cases. In terms of age, it was seen that older adults were the most affected, so it is important to highlight the late diagnosis of the disease, knowing that it can also be confused with other possible dermatological diagnoses.

With regard to schooling, the figures were significant, with illiterate individuals standing out with 1,913 (79%) multibacillary and 510 (21%) paucibacillary. Those with incomplete secondary education also showed a significant distribution, with 1,607 (61%) multibacillary, compared to 1,009 (39%) paucibacillary.

With regard to the degree of disability, there was a significant difference: patients with Grade II had a high prevalence of multibacillary cases, with 4,544 (92%) multibacillary compared to 378 (8%) paucibacillary. In Grade I, 9,648 (84%) were multibacillary, while 1,879 (16%) were paucibacillary.

With regard to the type of exit, the results were significant, for the outcome of cure was observed in 22,347 (66%) of multibacillary patients and in 11,636 (34%) paucibacillary patients. The death rate was higher among multibacillary patients, with 853 (92%) compared to 72 (8%) paucibacillary patients. Both the degree of disability and the outcomes corroborate the justification for the poor effectiveness of the services in carrying out early case detection activities. Despite being cured, some patients need to be followed up due to their degree of disability, requiring some kind of specialized care.

Table 3. Sociodemographic and clinical profile of patients affected by paucibacillary and multibacillary leprosy in the Southeast region of the country between the periods 2012 and 2022.

Variables	Paucibacillary		Multibacillary		
Sex	**N**	**%**	**N**	**%**	**P-valor**
Masculine	5593	23	18615	77	**<0,0001***
Feminine	7891	41	11288	59	
Race					
Ignored	663	31	1477	69	
White	5621	31	12734	69	
Black	1799	31	3988	69	**0,0510**
Yellow	106	28	279	72	
Brown	5261	32	11372	68	
Indigenous	33	38	55	62	
Age Range					
0 - 19 years	1723	53	1506	47	
20 - 39 years	3587	33	7300	67	**<0,0001***
40 - 59 years	5087	31	11502	69	
60 and over	3084	24	9593	76	
Education					
Ign/White	2625	28	6739	72	
Illiterate	510	21	1913	79	
Incomplete elementary education	5093	29	12277	71	
Complete elementary education	949	31	2136	69	
Incomplete high school	1009	39	1607	61	**<0,0001***
Complete high school	2177	37	3741	63	
Incomplete higher education	306	48	334	52	
Complete higher education	651	38	1073	62	
Not applicable	163	66	85	34	
Degree of Disability					
Blank	355	28	911	72	
Degree zero	10371	44	13345	66	
Degree I	1879	16	9648	84	**<0,0001***
Degree II	378	8	4544	92	
Not assessed	500	26	1457	74	
Type of Exit					
Not filled	586	15	3257	85	
Cure	11636	34	22347	66	**<0,0001***
Transfer	413	20	1635	80	
Death	72	8	853	92	

Abandonment	498	26	1427	74
Diagnostic error	278	42	386	68

Qui-quadrado test.;*: There was a significant difference between different groups studied by the chi-square test. Source: SINAN/ DATASUS.

Table 4 shows the distribution of the clinical and demographic variables of leprosy patients in the southern region of the country. With regard to gender, the figures were significant in this region, with 5,014 (86%) of multibacillary cases occurring in males, while 827 (14%) of the cases were paucibacillary. Among women, the proportion of multibacillary cases is lower, with 2,946 (72%), compared to 1,139 (28%) of paucibacillary cases. It is important to emphasize contact tracing and to improve the strategies adopted for men's health in PHC.

As for race, the figures were not significant, but the majority of multibacillary cases occurred among white people, 5,709 (80%), followed by brown people, 1,655 (81%). Paucibacillary cases are similarly distributed, with 1,427 (20%) among whites and 389 (19%) among browns. In relation to the brown race, it was seen that it is always similar to other studies on the subject of leprosy in Brazil, with a higher percentage for the race in question.

In the analysis by age group, the figures were significant, with the majority of multibacillary cases occurring in individuals aged 60 or over - 2,851 (86%). On the other hand, the 0-19 age group had a higher proportion of paucibacillary cases, 155 (43%). In terms of schooling, individuals with incomplete primary education account for the majority of multibacillary cases 4,138 (83%), while incomplete secondary education accounts for a higher proportion of paucibacillary cases 140 (31%).

Regarding the degree of disability, the majority of multibacillary patients have grade II disability 1,069 (97%), while paucibacillary cases are mainly concentrated in grade I 270 (91%). In addition, with regard to the type of exit, cure is the most frequent category among multibacillary cases 6,122 (79%), while 792 (88%) of paucibacillary cases remain without a record of the type of exit. The values for these variables were significant in this region.

In relation to brown race, age group, degree of disability and outcome, it was seen that it is similar to other studies on the subject of leprosy in Brazil, a higher percentage for brown race, age group in older adults, low schooling and degree of disability reflecting the degree of education of the individual to understand the seriousness of the disease and early diagnosis, to minimize the possible damage that the bacteria causes.

Table 4. Sociodemographic and clinical profile of patients affected by paucibacillary and multibacillary leprosy in the southern region of the country between 2012 and 2022.

Variables	Paucibacillary		Multibacillary		
Sex	**N**	**%**	**N**	**%**	**P-valor**
Masculine	827	14	5014	86	**<0,0001***
Feminine	1139	28	2946	72	
Race					
Ignored	28	20	111	80	
White	1427	20	5709	80	
Black	104	20	425	80	**0,8035**
Yellow	15	25	44	75	
Brown	389	19	1655	81	
Indigenous	3	16	16	84	
Age Range					
0 - 19 years	155	43	208	57	
20 - 39 years	533	26	1544	74	**<0,0001***
40 - 59 years	801	19	3357	81	
60 and over	477	14	2851	86	
Education					
Ign/White	308	20	1246	80	
Illiterate	92	12	685	88	
Incomplete elementary education	860	17	4138	83	
Complete elementary education	135	20	540	80	
Incomplete high school	140	31	319	69	**<0,0001***
Complete high school	253	26	731	74	
Incomplete higher education	48	34	93	76	
Complete higher education	109	35	199	65	
Not applicable	21	70	9	30	
Degree of Disability					
Blank	58	22	204	78	
Degree zero	1536	70	3543	70	
Degree I	270	91	2849	91	**<0,0001***
Degree II	36	97	1069	97	
Not assessed	66	18	295	82	
Type of Exit					
Not filled	109	12	792	88	
Cure	1648	21	6122	79	
Transfer	58	11	455	89	
Death	17	6	246	94	
Abandonment	54	18	251	82	**<0,0001***
Diagnostic error	80	46	94	54	

Qui-quadrado test.;*: There was a significant difference between different groups studied by the chi-square test. Source: SINAN/ DATASUS.

Table 5 details the distribution of the clinical and demographic variables of leprosy patients in the Central-West region. With regard to gender, the figures were significant, with the majority of cases in men being classified as multibacillary - 27,633 cases (87%), while 4,299 (13%) were paucibacillary. In women, 22,294 cases (81%) were multibacillary and 5,377 (19%) paucibacillary. Cases of leprosy have become increasingly alarming, and this study found that the percentage of cases in men classified as multibacillary was higher than in women, a narrative that corroborates the other literature in question. On the other hand, there was no significant difference between the figures for race, but most multibacillary cases occurred among brown people, with 26,754 (84%) cases and white people with 15,948 (84%) cases, followed by black people with 5,603 (84%) cases, yellow people with 402 (83%) cases and indigenous people with 247 (83%) new cases. Paucibacillary cases were also more frequent among brown people with 5,160 (16%) and white people with 3,123 (16%). Although there were no major disparities in the number of cases, the brown race was still the race in which the disease occurred most, confirming previous studies in which the brown race is still the predominant race when it comes to leprosy in Brazil, as well as social vulnerability.

Considering the age group, there was a significant difference. The highest proportion of multibacillary cases was observed among individuals aged 20 to 39 years 130,668 cases (98%), while in the 0 to 19 age group, there was a higher proportion of paucibacillary cases 1,414 cases (29%). In this case, the distribution of cases is in line with the study by Gomes et al. (2024), affecting the economically active population, which would be made up of young people and adults, who are more exposed to infection. In terms of schooling, individuals with incomplete primary education had the highest number of multibacillary cases - 22,219 (85%) cases. In terms of paucibacillary cases, the highest proportion was among those with complete secondary education 1,481 cases (18%). As for the degree of disability, the majority of cases with grade I were multibacillary 14,975 (94%) cases, as were those with grade II 3,708 (97%) cases. With regard to the type of outcome, the majority of multibacillary cases resulted in a cure, 35,074 cases (82%), while among paucibacillary cases, 7,937 cases (18%) also resulted in a cure. With regard to the degree of disability, PHC needs to pay attention to training professionals, as well as active contact tracing.

Table 5. Sociodemographic and clinical profile of patients affected by paucibacillary and multibacillary leprosy in the Central-West region of the country between 2012 and 2022.

Variables	Paucibacilar		Multibacilar		
Sex	**N**	**%**	**N**	**%**	**P-valor**
Masculine	4299	13	27633	87	**<0,0001***
Feminine	5377	19	22294	81	
Race					
Ignored	224	11	975	49	
White	3123	16	15948	84	
Black	1038	16	5603	84	**0,1708**
Yellow	83	17	402	83	
Brown	5160	16	26754	84	
Indigenous	49	17	247	83	
Age Range					
0 - 19 years	1414	29	3463	71	
20 - 39 years	3102	2	130668	98	**<0,0001***
40 - 59 years	3631	14	22232	86	
60 and over	1530	12	11166	88	
Education					
Ign/White	1379	17	6892	83	
Illiterate	476	12	3582	88	
Incomplete elementary education	3975	15	22219	85	
Complete elementary education	676	17	3413	83	
Incomplete high school	787	17	3725	83	**<0,0001***
Complete high school	1481	18	6797	82	
Incomplete higher education	228	20	924	80	
Complete higher education	538	20	2219	80	
Not applicable	137	46	158	54	
Degree of Disability					
Blank	302	15	1704	85	
Degree zero	7587	23	24906	77	
Degree I	976	6	14975	94	**<0,0001***
Degree II	106	3	3708	97	
Not assessed	706	13	4636	87	
Type of Exit					
Not filled	426	8	4695	92	
Cure	7937	18	35074	82	**<0,0001***
Transfer	532	10	4752	90	
Death	39	5	823	95	

Abandonment	500	12	3531	88
Diagnostic error	243	19	1054	81

Qui-quadrado test.;*: There was a significant difference between different groups studied by the chi-square test. Source: SINAN/ DATASUS.

The findings of this study exposed the epidemiological context of leprosy in the regions of Brazil over a ten-year period. Between 2012 and 2022, there was a high proportion in the detection rates of new leprosy cases, with the multibacillary form having the highest proportions compared to the paucibacillary form in all the regions analyzed.

The data provides evidence that the disease remains endemic in the country. In line with this, a study carried out in Brazil between 2001 and 2020 also found an endemic trend of the disease, highlighting the deficit in the quality of care, management and control of leprosy, as well as little effectiveness in the early detection of cases as critical appeals to Public Health in the country [16].

The analysis of the proportion of the sex indicator revealed that men had higher proportions of multibacillary forms in all the regions investigated, while paucibacillary forms were higher among the female population. Similar results to those found in this study were described by [17], who reported a higher number of multibacillary cases in males.

There is no doubt that men and women are rarely affected in the same way by infectious diseases. According to [18], there are hypotheses that physiological and genetic interactions can determine greater susceptibility to infections depending on gender, as well as behavioral hypotheses, referring to the level of exposure to contagion factors. However, with regard to the various behavioral characteristics between men and women, it is believed that this does not influence the exposure of individuals to M. leprae.

Furthermore, the difference in the proportion of multibacillary forms between the sexes can also be explained by the late diagnosis of the disease in the male population. These factors include poor access to health services, as well as cultural factors that lead to stigmatization and neglect of aspects related to one's own health. In addition, studies have noted that there is little focus and structure in actions related to men's health within the scope of Primary Health Care (PHC), which contributes to the proportional differences identified [19] [16].

In addition, new cases for race were only significant in the North and Northeast regions, with a considerable value for the brown race. When comparing this study with other similar ones, such as the one carried out in the state of Piauí between 2007-2021, in which the brown race had a higher proportion of leprosy cases, it can be seen that the national

sociodemographic profile does not show a predominance of race, and is subject to changes in prevalence in each region.

In all regions of the country, the multibacillary form prevails in all age groups, with the highest rate mainly in the “20 to 59 years” age group. The increase in this data is directly related to the fact that individuals belonging to this group are economically active, perform work activities and generally do not have as much availability to leave the place of service in search of diagnosis and treatment, which influences a late diagnosis, in addition to the fact that this group tends to be more exposed to communicable diseases due to increased contact with the public in work routines [21] [22].

The rate of cases in patients aged 60 and over is very evident in the northeast and central-west regions. Overall, this rate of involvement may be related to various factors, including the biological process of aging itself, which implies a drop in the immune system, leaving the individual more prone to infections and other diseases, generating functional and neurological complications and, consequently, implying the process of senescence as leprosy generates disabilities when not treated in a timely manner [21].

In relation to the level of schooling, the results were significant in all regions, where the study showed that people with lower levels of schooling had higher percentages of cases and the regions show a difference between the numbers of cases related to the operational form of the disease. One study showed that low schooling, disadvantaged socioeconomic factors and social vulnerability are conditions that influence the increase in leprosy rates in Brazil [23]. In addition, lack of education limits understanding of the disease, which contributes to treatment abandonment [24].

With regard to the degree of disability, based on the data provided, a predominance of grade zero is suggested in all regions, similar to the results found [18]. However, there are relevant values for disability grade I (G1D) and II (G2D) in an exponential manner.

According to a study carried out in 2023, as indicated by the log-logistic-gamma shared frailty models (1.033), there is an increased risk of disability for patients aged 30 or over and this can be explained by late diagnosis, which is shown to be one of the main factors for the increase in cases [25] [26]. In addition, studies have shown that the chances of G2D disability are twice as high among males, which is due to the low presence of these users in PHC services [18]. Thus, the long duration of symptoms for untreated leprosy patients has been another significant risk factor for physical disabilities and, therefore, there are still gaps in comprehensive health care for affected individuals, making it necessary to strengthen the screening and active search for cases, especially in poorer regions with a high incidence in Brazil.

With regard to the type of case outcome, the values were significant in all the regions analyzed. The number of cured cases was high, revealing a more expected treatment outcome for leprosy patients. In view of this, the leprosy control and elimination program is fundamental, since it governs the way the disease is managed, the correct and effective treatment and the monitoring and detection of new cases as early as possible [27].

The death rate and misdiagnosis are relatively low compared to the others, but they are important as they are parameters for proper management of the disease. Furthermore, this low number of deaths may be directly related to uninvestigated cases, underreporting and failure to monitor deaths. In some cases, deaths from severe leprosy sequelae are a reflection of the failure to reach PHC, leaving irreparable gaps in patient care [28].

With regard to abandonment, the figures were significant in all regions of the country, especially in the multibacillary form. Interruption of treatment directly influences the increase in bacillus transmission and the worsening of the disease, especially in the presence of physical disability among multibacillary patients [29] [30]. Education and health promotion activities for all in an inclusive manner are strategies that contribute to the reduction of new cases, facilitate early diagnosis and continuity of treatment, since the population would be able to identify signs suggestive of leprosy, enabling early diagnosis and treatment [19] [31] [32].

4. CONCLUSION

The article showed the complexity of leprosy in Brazil, revealing the epidemiological scenario of new cases of the disease between 2012 and 2022. There were significant variations in the sociodemographic and clinical profile in different regions of the country. In the meantime, it was possible to see a heterogeneity of new leprosy cases between regions in terms of the sociodemographic and clinical profile of the operational forms of leprosy. It was observed that the multibacillary form of the disease predominated in all the contexts analyzed, especially among men, the elderly, illiterate people and those with a higher degree of disability. This predominance suggests that, despite ongoing efforts to control leprosy, there are still significant challenges to be faced, particularly in terms of early diagnosis and adequate treatment to avoid serious complications. Socioeconomic and educational inequalities emerge as critical factors, directly influencing the severity and outcome of the disease. Patients with lower levels of schooling and poorer living conditions had a higher proportion of multibacillary cases and higher rates of disability and mortality. These findings reinforce the need for more effective public policies, focused on vulnerable populations and endemic regions, to reduce the burden of leprosy and its consequences. Therefore, the

continuation of public health strategies, such as strengthening primary care, monitoring contacts and expanding access to early diagnosis and treatment, is essential to achieve leprosy control in Brazil. In addition, the fight against the stigma and discrimination associated with the disease must be intensified, promoting the social inclusion of affected individuals and guaranteeing them a better quality of life.

We suggest evaluating emerging technologies, such as rapid diagnostics, artificial intelligence and sensors, and implementing these methods in communities affected by crises, especially in Basic Health Units and the Family Health Strategy aimed at degrees of disability, comparing them with traditional methods.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

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