ORIGINAL ARTICLE

EPIDEMIOLOGICAL PROFILE AND DISTRIBUTION OF HANSEN'S DISEASE" CASES IN THE STATE OF AMAZONAS

Débora Oliveira Marques[1]; Eduarda Cândida Gomes Aguiar[2]
Keven de Oliveira Cosme[3]; Yone Almeida da Rocha[4]
Nathália França de Oliveira[5]

Highlights: (1) Hansen's disease primarily affects vulnerable populations in the state of Amazonas. (2) High incidence across all mesoregions of Amazonas. (3) Number of affected nerves does not correspond to the clinical form of diagnosis. (4) Challenges in clinical evaluation and proper case reporting. (5) Need to promote continuous education initiatives.

PRE-PROOF
(as accepted)
This is a preliminary and unedited version of a manuscript that has been accepted for publication in *Revista Contexto & Saúde*. As a service to our readers, we are providing this early version of the manuscript as accepted. The article will still undergo copyediting, formatting, and final approval by the authors before official publication in its final form.

http://dx.doi.org/10.21527/2176-7114.2025.50.15442

How to cite:
Marques DO, Aguiar ECG, Cosme K de O, da Rocha YA, de Oliveira NF. Epidemiological profile and distribution of hansen's disease" cases in the state of amazonas. Rev. Contexto & Saúde, 2025;25(50): e15442

[1]State University of Amazonas - Graduate Program in Collective Health . Manaus/AM, Brazil. https://orcid.org/0000-0002-0546-3130

[2]State University of Amazonas - Graduate Program in Collective Health . Manaus/AM, Brazil. https://orcid.org/0000-0001-7836-446X

[3]State University of Amazonas - Graduate Program in Collective Health . Manaus/AM, Brazil. https://orcid.org/0000-0002-0869-2107

[4]State University of Amazonas - Graduate Program in Collective Health. Manaus/AM, Brasil. https://orcid.org/0000-0001-9407-469X

[5]State University of Amazonas - Graduate Program in Collective Health. Manaus/AM, Brazil. https://orcid.org/0000-0002-7420-4634

ABSTRACT

Objective: To describe the epidemiological profile and distribution of hansen's disease cases in the state of Amazonas between 2018 and 2022. **Method:** This is a descriptive study based on secondary data with a quantitative approach, conducted in the 62 municipalities of the state of Amazonas. Data were obtained from reported cases in the Notifiable Diseases Information System (SINAN) during the period from 2018 to 2022. **Results:** Sociodemographic data reveal a higher number of cases among adult males and individuals of mixed race (pardo). Hansen's disease also more frequently affects individuals with low educational attainment. Regarding clinical characteristics, 73.9% of cases were classified as multibacillary, with the dimorphic form being predominant and physical disability commonly classified as "grade zero." There was a statistically significant association between the operational classification and the number of lesions, clinical form, and therapeutic regimen. The Southern Mesoregion recorded the highest rates of new cases, with a significant shift in this pattern only in 2022. A reduction in hansen's disease rates was observed across all mesoregions in 2020 and 2021, reflecting the impact of the COVID-19 pandemic. **Conclusion:** Hansen's disease remains a prevalent disease among vulnerable populations in the state of Amazonas, with high incidence rates in all mesoregions. Active surveillance of hansen's disease in Amazonas is essential, focusing on early detection and reduction of transmission sources. Continuous permanent education initiatives are necessary to train healthcare professionals in the proper identification and management of hansen's disease cases.

Keywords: Hansen's disease; Epidemiological Monitoring; Health Profile; Disease Notification; Health Information Systems.

INTRODUCTION

Hansen's disease is a chronic infectious disease caused by Mycobacterium leprae, transmitted through airborne routes via close and prolonged contact between a vulnerable individual and an untreated infected person[1,2]. Characterized by high infectivity and low pathogenicity, it is estimated that about 90% of the population may have come into contact with the bacillus, yet only 10% develop the disease, which can be classified as either Paucibacillary (PB) or Multibacillary (MB)[3].

According to the World Health Organization (WHO), 140,594 new cases of the disease were reported globally in 2021, representing a 10.2% increase in the detection rate compared to the previous year. India accounted for the highest number of new cases, with approximately 53.6% of the global total. In the Americas region, 19,826 new cases were reported, 92.4% of which occurred in Brazil, making it the second country with the highest number of new cases, followed by Indonesia. Together, these three countries accounted for 74.5% of the global total[2].

Between 2012 and 2021, a total of 269,086 hansen's disease cases were reported in Brazil. The Central-West region consistently showed the highest detection rate, followed by the North, Northeast, Southeast, and South regions, with only the latter two remaining below the national rate. In 2018, the North region ranked second in terms of highest notification rates. From 2013 to 2021, 17 Brazilian states experienced an increase in the number of hansen's disease cases. The state of Amazonas stood out with the highest increase, registering a 31.5% rise. However, during the same period, Amazonas also recorded the highest increase in cure rates, with an 8.1% growth, followed by the states of Rio Grande do Norte and Sergipe[42].

Given this context, the importance of hansen's disease surveillance in Brazil is underscored, with a focus on early detection and the reduction of transmission sources. A systematic and continuous analysis of the epidemiological and operational situation is crucial to support planning and interventions aimed at reducing disease transmission[5]. Therefore, this study aims to describe the epidemiological profile and distribution of hansen's disease cases in the state of Amazonas between the years 2018 and 2022.

METHODS

This is a descriptive, secondary data-based study with a quantitative approach, conducted in the 62 municipalities of the state of Amazonas. The study population consisted of hansen's disease cases reported in the Notifiable Diseases Information System (SINAN) from 2018 to 2022, with data collected in June 2023. For reporting purposes, a hansen's disease case is defined as a person presenting at least one of the following characteristics: one or more skin lesions with altered sensitivity; involvement of nerve(s) with neural thickening; or a positive bacilloscopy. Once a case is identified, multidrug therapy is initiated[2].

For the transfer of microdata from the website of the Department of Informatics of the Unified Health System (DATASUS), dBase File Compacted (.dbc) files from SINAN were used, covering the selected years and referring to the condition "hansen's disease" in Brazil. File conversion for further manipulation was carried out using RStudio (version 4.2.1). After

converting the databases to Comma Separated Values (.csv) format, the "Notification State" field was filtered to the number "13", corresponding to the state of Amazonas.

To analyze the epidemiological profile, absolute and relative frequencies of reported cases per year were used, divided into sociodemographic characteristics ("Age Group"; "Sex"; "Race"; "Education Level"; "Pregnancy"; "Occupation") and clinical variables ("Operational Classification"; "Clinical Form"; "Disability Grade Assessment"; "Number of Affected Nerves"; "Number of Lesions"; "Type of Entry"; "Therapeutic Regimen"; "Number of Registered Contacts"). To compare the "Operational Classification" with the variables "Number of Lesions", "Clinical Form", and "Therapeutic Regimen", the chi-square statistical test was applied.

The operational classification followed the Clinical Protocol and Therapeutic Guidelines for hansen's disease (PCDT)[2]:

- Paucibacillary hansen's disease: up to 5 skin lesions, few nerves affected, Indeterminate and Tuberculoid clinical forms. Therapeutic regimen: 6 doses.
- Multibacillary hansen's disease: 6 or more skin lesions, many nerves affected, Dimorphous and Virchowian clinical forms. Therapeutic regimen: 9 doses.

Regarding the variable Physical Disability Grade (PDG), the classification followed the guidelines of the Brazilian Ministry of Health and the Madrid Classification[6]:

- PDG 0 – no clinical manifestation;
- PDG I – loss of sensitivity in one segment (eyes, hands, or feet);
- PDG II – loss of sensitivity in more than one segment.

The municipalities were grouped by Mesoregions as follows:

North (6 municipalities): Barcelos, Japurá, Maraã, Novo Airão, Santa Isabel do Rio Negro, São Gabriel da Cachoeira.

Southeast (16 municipalities): Amaturá, Atalaia do Norte, Benjamin Constant, Carauari, Eirunepé, Envira, Fonte Boa, Guajará, Ipixuna, Itamarati, Juruá, Jutaí, Santo Antônio de Içá, São Paulo de Olivença, Tabatinga, Tonantins.

South (10 municipalities): Apuí, Boca do Acre, Borba, Canutama, Humaitá, Lábrea, Manicoré, Novo Aripuanã, Pauini, Tapauá.

Central (30 municipalities): Alvarães, Anamã, Anori, Autazes, Barreirinha, Beruri, Boa Vista do Ramos, Caapiranga, Careiro, Careiro da Várzea, Coari, Codajás, Iranduba, Itacoatiara, Itapiranga, Manacapuru, Manaquiri, Manaus, Maués, Nhamundá, Nova Olinda do Norte,

Parintins, Presidente Figueiredo, Rio Preto da Eva, São Sebastião do Uatumã, Silves, Tefé, Uarini, Urucará, Urucurituba.

To calculate the hansen's disease notification rates by Mesoregion for the selected years, the estimated population was used. However, for the last year of the study, data from the 2022 census provided by IBGE[7–8] were used. The denominator consisted of the total population of the municipalities in each Mesoregion, and the numerator was the total number of cases in each calculated Mesoregion, multiplied by 100,000 inhabitants.

$$\frac{Number\ of\ cases\ per\ mesoregion}{Population\ of\ the\ mesoregion} \times 100.000\ Inhabitants$$

In the interpretation of rates, the parameters recommended by the "Guidelines for the Use of SINAN Net hansen's disease" and the "Manual for Tabulation of Hansen's Disease Indicators" were adopted[3]:

- Low: <2.00 per 100,000 inhabitants;
- Medium: 2.00 to 9.99 per 100,000 inhabitants;
- High: 10.00 to 19.99 per 100,000 inhabitants;
- Very high: 20.00 to 39.99 per 100,000 inhabitants;
- Hyperendemic: ≥40.00 per 100,000 inhabitants.

This study was not submitted to a Research Ethics Committee, as it uses secondary public domain data that do not allow the identification of patients, in accordance with Resolution No. 510/2016 of the National Commission for Research Ethics (CONEP)[9].

RESULTS

When analyzing the sociodemographic data, the highest number of cases was found in adults (60.6%), followed by older adults (17.7%). The average age of affected individuals was 42 years (SD ±18.3), a value that remained constant over the study period. Most of the reported cases were male (62.1%), and 0.8% were identified in pregnant women. Regarding the "race" variable, the majority of notifications were among individuals identified as mixed race (74.6%) (Table 1).

With respect to "education level," a higher incidence was observed among those who had completed only elementary school (41.7%). It is important to highlight that this variable had a significant amount of missing data (23.8%), as did the "occupation" variable, which was

classified as "no information" in 27.6% of cases, while "other" accounted for 35%. In the "pregnant women" category, a notable lack of information was also observed, with 75.5% of the data being absent (Table 1).

Table 1. Sociodemographic characteristics of reported hansen's disease cases in Amazonas, from 2018 to 2022.

Variables	Total		2018		2019		2020		2021		2022	
	N	%	N	%	N	%	N	%	N	%	N	%
Age group (life cycle)												
Children and adolescents	324	14,5	84	15,8	66	12,7	38	12,2	75	17,7	61	13,6
Young adults	161	7,2	33	6,2	38	7,3	28	9,0	31	7,3	31	6,9
Adults	1.354	60,6	319	60,1	320	61,8	189	60,6	247	58,4	279	62,0
Elderly	395	17,7	95	17,9	94	18,1	57	18,3	70	16,5	79	17,6
Mean age (±sd)	42.0 (±18.3)		41.2 (±18.6)		42.7 (±18.7)		41.5 (±17.9)		40.4 (±18.3)		42.0 (±17.9)	
Sex												
Male	1.391	62,1	331	62,2	316	60,9	205	65,5	266	62,7	273	60,4
Female	849	37,9	201	37,8	203	39,1	108	34,5	158	37,3	179	39,6
Pregnant												
Yes	17	0,8	4	0,8	4	0,8	0	0,0	5	1,2	4	0,9
No	531	23,7	119	22,5	111	21,4	65	20,8	104	24,5	132	29,1
Not applicable/ignored	1.690	75,5	406	76,7	404	77,8	248	79,2	315	74,3	317	70,0
Race												
White	221	9,9	61	15,5	48	9,2	27	8,6	41	9,7	44	9,7
Black	129	5,8	28	5,3	31	6,0	19	6,1	24	5,7	27	6,0
Asian	10	0,4	4	0,8	1	0,2	0	0,0	3	0,7	2	0,4
Brown (mixed race)	1.670	74,6	396	74,4	368	70,9	252	80,5	319	75,2	335	74,1
Indigenous	145	6,5	26	4,9	48	9,2	10	3,2	23	5,4	38	8,4
Ignored	65	2,8	17	3,2	23	4,4	5	1,6	14	3,3	6	1,3
Schooling / Education level												
Illiterate	185	8,3	47	8,8	40	7,7	30	9,6	32	7,5	36	8,0
Primary education	934	41,7	234	44,0	226	43,5	143	45,7	169	39,9	162	35,8
Secondary education	492	22,0	122	22,9	135	26,0	70	22,4	75	17,7	90	19,9
Higher education	94	4,2	19	3,6	23	4,4	19	6,1	12	2,8	21	4,6
Ignored	535	23,8	110	20,7	95	18,3	51	16,3	136	32,1	143	31,6
Occupation												
Housewife	161	7,2	33	6,2	36	6,9	13	4,2	41	9,7	38	8,4
Agricultural producer	105	4,7	40	7,6	24	4,6	23	7,3	14	3,3	4	0,9
Student	265	11,8	56	10,6	60	11,6	36	11,5	60	14,2	53	11,7
Agricultural worker	206	9,2	44	8,3	44	8,5	22	7,0	49	11,6	47	10,4
Retired	101	4,5	17	3,2	26	5,0	12	3,8	23	5,4	23	5,1
Others	783	35,0	221	41,8	202	38,9	115	36,7	105	24,8	140	30,9
No information	617	27,6	118	22,3	127	24,5	92	29,4	132	31,1	148	32,7

Source: Information System for Notifiable Diseases (SINAN)

Regarding the clinical characteristics of hansen's disease (Table 2), the most frequent category under the "operational classification" variable was multibacillary (73.9%). The most prevalent clinical form was the dimorphic type (43.4%). In terms of the "disability grade assessment," the highest proportions were concentrated in grades zero (44.1%) and one (35.1%); however, it is noteworthy that 7.7% of reported cases were not evaluated. Concerning the number of skin lesions, the highest frequency was in the "1 to 5 lesions" category (46.5%). Nevertheless, a discrepancy was observed when compared to the operational classification, since the majority of cases were recorded as multibacillary hansen's disease. The average number of lesions was 6.47 (SD ± 9.57).

Table 2. Clinical characteristics of hansen's disease notifications in Amazonas, between 2018 and 2022.

Variables	Total		2018		2019		2020		2021		2022	
	N	%	N	%	N	%	N	%	N	%	N	%
Operational classification												
Paucibacillary	584	26,1	168	36,6	162	31,2	80	25,6	95	22,4	79	17,5
Multibacillary	1.656	73,9	364	68,4	357	68,8	233	74,4	329	77,6	373	82,5
Forma clínica												
Indeterminate	248	11,1	71	13,3	73	14,1	39	12,5	35	8,3	30	6,6
Dimorphic	972	43,4	207	38,9	207	39,9	154	49,2	190	44,8	214	47,3
Tuberculoid	386	17,2	101	19,0	102	19,7	50	16,0	76	17,9	57	12,6
Virchowian	404	18,0	103	19,4	100	19,3	45	14,4	75	17,7	81	17,9
Not evaluated	230	10,3	50	9,4	37	7,1	25	8,0	48	11,3	70	15,5
Assessment of degree of disability												
Grade 0	988	44,1	273	51,3	251	48,4	125	39,9	184	43,4	155	34,3
Grade 1	786	35,1	164	30,8	166	32,0	109	34,8	147	34,7	200	44,2
Grade 2	315	14,1	67	12,6	68	13,1	51	16,3	67	15,8	62	13,7
Not evaluated	151	7,7	28	5,3	34	6,6	28	8,9	26	6,1	35	7,7
Nº of injuries												
Until 5	285	61,4	319	60,0	308	59,3	187	59,7	276	65,1	285	63,1
From 6 to 15	94	23,4	122	22,9	132	25,4	82	26,2	95	22,4	94	20,8
16 or older	46	10,1	59	11,1	53	10,2	30	9,6	38	9,0	46	10,2
Not evaluated	27	5,1	32	6,0	26	5,0	14	4,5	15	3,5	27	6,0
Average (±dp)	6.47 (±9.57)		7.18(±10.8)		6.41(±8.58)		5.95(±8.03)		5.95(±8.68)		6.57(±10.9)	
Nº of nerves affected												
None	692	30,9	193	36,3	197	38,0	97	31,0	106	25,0	99	21,9
1 to 5	1.042	46,5	234	44,0	227	43,7	164	52,4	208	49,1	209	46,1
6 or older	323	14,4	53	10,0	56	10,8	34	10,9	81	19,1	99	21,9
Not evaluated	183	8,2	52	9,8	39	7,5	18	5,8	29	6,8	45	10,0
Average (±dp)	2.43 (±2.71)		2.00 (±2.38)		1.94 (±2.47)		2.22 (±2.61)		2.91 (±2.87)		3.21 (±2.99)	
Input mode												
New case	1.790	80,0	436	82,4	420	80,9	240	76,7	348	82,1	346	76,4
Transfers	94	4,2	24	4,5	21	4,0	9	2,9	15	3,5	25	5,5
Relapses	190	8,5	34	6,4	38	7,3	39	12,5	34	8,0	45	9,9
Other tickets	163	7,3	35	6,6	40	7,7	25	8,0	27	6,4	36	7,9
Ignored	1	0,0	0	0,0	0	0,0	0	0,0	0	0,0	1	0,2
New case detection mode												
Forwarding	486	21,7	129	24,4	117	22,5	68	21,7	87	20,5	85	18,8
Spontaneous demand	926	41,4	224	42,3	207	39,9	150	47,9	173	40,8	172	38,0
Examination of collect./contacts	362	16,2	77	14,6	88	17,0	23	7,3	93	21,9	81	17,9
Other modes	24	1,1	3	0,6	10	1,9	3	1,0	4	0,9	4	0,9
Ignored/ no information	440	19,7	96	18,1	97	18,7	69	22,0	67	15,8	111	24,5
Therapeutic scheme												
PB – 6 doses	576	25,8	167	31,6	158	30,5	80	25,6	93	21,9	78	17,3
MB – 9 doses	1.638	73,3	360	68,1	355	68,5	229	73,2	328	77,4	366	81,0
Other schemes	22	1,0	2	0,4	5	1,0	4	1,3	3	0,7	8	1,8

Source: Notifiable Diseases Information System (SINAN)

In Table 3, statistical differences are observed between the compared variables ($p<0.01$). When comparing operational classification and the number of lesions, it is identified that 60% of cases with up to five lesions are misclassified in the notification form, considering that the correct classification for these individuals would be paucibacillary. Similarly, 3% of cases with "six or more lesions" are incorrectly classified, as they should be multibacillary. Regarding clinical evaluation, 86% of multibacillary cases were not evaluated. Among the classified data, inconsistencies are evident, as 37.4% of indeterminate and tuberculoid cases were defined as multibacillary, while 3.4% of dimorphic and Virchowian cases were classified as paucibacillary. Regarding the relationship between treatment and operational classification, the multibacillary (MB) regimen was predominantly chosen.

Table 3. Diagnostic and treatment characteristics according to the operational classification of reported cases of hansen's disease in Amazonas, between 2018 and 2022.

Variables	Operational Classification		p-value
	Paucibacillary N (%)	Multibacillary N (%)	
Nº of injuries			
Until 5	554 (40,3)	821 (59,7)	
From 6 to 15	11 (2,1)	513 (97,9)	<0.01
16 or older	2 (0,9)	223 (99,1)	
Not evaluated	16 (14,0)	98 (86,0)	
Clinical form			
Undetermined	206 (83,1)	42 (16,9)	
Tuberculoid	306 (79,5)	79 (20,5)	<0.01
Dimorphic	21 (2,2)	951 (97,8)	
Virchowian	5 (1,2)	398 (98,8)	
Not classified	18 (12,3)	128 (87,7)	
Therapeutic scheme			
PB – 6 doses	567 (98,4)	9 (1,6)	0.01
MB – 9 doses	12 (0,7)	1.626 (99,3)	
Other schemes	4 (18,2)	18 (81,8)	

Source: Notifiable Diseases Information System (SINAN)

It was observed in Table 4 that the Southern Mesoregion recorded the highest notification rates of new hansen's disease cases, showing very high detection rates. However, in 2022, the Northern Mesoregion had the highest incidence rate in the state, despite having the lowest number of inhabitants in its territorial area. It is worth noting that this region comprises six municipalities, with Novo Airão being the only city that did not report new cases of the disease in that year.

The Central Mesoregion, despite having the largest population in its territory, showed the lowest notification rates of hansen's disease, maintaining "medium" detection rates. However, in 2019, it recorded a rate considered "high." As for the Southwestern Mesoregion, the highest incidence rate was recorded in 2018; however, compared to the others, it had the second lowest notification rate overall.

It is noteworthy that 32 municipalities (51.6%) in the state of Amazonas did not detect hansen's disease cases at least once or more during the study period. Among them, Amaturá and São Paulo de Olivença, located in the Southwestern Mesoregion, and Alvarães, in the Central Mesoregion, were the only ones that never reported any hansen's disease cases.

It is emphasized that in all mesoregions, during the years 2020 and 2021, the hansen's disease rates per 100,000 inhabitants decreased considerably compared to the other years in the analyzed sample, which may be a consequence of the COVID-19 pandemic.

Table 4. Distribution of the number of cases and notification rate of hansen's disease by mesoregion of Amazonas, between 2018 and 2022.

Year/Mesorregion	North		South-west		Center		South		Total	
	N	Rate*	N	Rate*	N	Rate*	N	Rate*	N	Rate*
2018	27	19,70	66	16,52	319	9,91	120	36,63	532	13,03
2019	17	12,26	59	14,58	332	10,15	111	33,41	519	12,52
2020	10	7,13	32	7,82	203	6,11	68	20,19	313	7,43
2021	5	3,52	51	12,31	273	8,09	95	27,84	424	9,92
2022	32	25,61	62	15,46	291	9,41	67	20,57	452	11,46
Total	91	13,64	211	13,33	1418	8,73	461	27,72	2240	10,87

* Per 100 thousand inhabitants
Source: Notifiable Diseases Information System (SINAN)

DISCUSSION

This study identifies a predominance of cases among adults, with a mean age of 42 years among individuals affected by the disease. These findings are consistent with the literature, which reports that hansen's disease is more prevalent among adults and the elderly. However, the notification and detection of cases in young adults and individuals under 15 years of age should not be underestimated, as they indicate active transmission of the bacillus, with potential for continued spread. Moreover, such findings reflect inadequate disease control by health services[10].

egarding the sex variable, a predominance of male cases was observed, in line with other studies[4],[11]-[12]. It can be assumed that men may play a role in the transmission of hansen's disease, possibly due to reduced attention to health care, as discussed by Dharmawan and colleagues (2021), which may prolong the time until disease development[13].

This study revealed an incidence of only 0.8% of hansen's disease in pregnant women, as also observed in a study conducted in the Carajás region, in the state of Pará. It was found that the number of pregnant women affected by hansen's disease is considerably lower than in the general population, and clinical signs usually appear from the third trimester of pregnancy onward, allowing for diagnosis from that point on[14].

According to the 2023 Hansen's disease Epidemiological Bulletin, in Brazil, between the years 2017 and 2021, individuals who self-identified as mixed race (pardo) accounted for the highest incidence rates of the disease[2]. This information is consistent with the findings of this study, which identified a higher number of cases among the mixed-race population, as well as among individuals with completed primary education. Low educational attainment may be closely related to difficulties in understanding information about hansen's disease, which is also reflected in the high number of people who are self-employed or unemployed, resulting in low monthly income—one of the factors associated with the disease[15].

In most cases, the occupation of the affected individuals was either not reported or categorized as "other," making it impossible to establish a correlation between the disease and the individual's current occupation. This indicates failures in properly completing the notification form. However, a study conducted in South Asia identified a significant association between manual laborers and disability caused by hansen's disease, when compared to those not engaged in such work[16].

Regarding clinical characteristics, most cases were classified as multibacillary and defined as borderline. The prevalence of multibacillary cases has been reported in several studies[17]–[18], suggesting that the predominance of this form indicates delayed diagnosis, contributing to the transmission chain and to an increased degree of physical disability[19]. In other Latin American countries, this aspect was also observed between 2011 and 2020, with multibacillary cases occurring two to six times more frequently than paucibacillary cases[20].

The findings show that in all years of the study, the majority of individuals presented with up to five lesions, which does not correspond to the predominant clinical form. However, this can be explained by the Clinical Protocol and Therapeutic Guidelines (PCDT), which recommend that hansen's disease cases with uncertainty in operational classification should be

treated as multibacillary[2]. This highlights the need for continuous health education to improve the qualification of professionals regarding the correct classification of the disease and the proper completion of the notification form.

In the present analysis, the results show that up until the year 2021, most affected individuals did not present with physical disabilities and were classified as Grade 0 Disability (G0D). However, in 2022 alone, there was an increase in the number of individuals classified as Grade 1 Disability (G1D). A study using SINAN data from 2006 to 2017 also showed that the majority of cases in Brazil were classified as G0D (58.3%)[21]. This trend was also observed in a study conducted in the metropolitan region of Belém, in the state of Pará, where 71.8% of patients examined at a dermatological center were classified as G0D[22]. Regarding the number of nerves affected, similar trends have been observed in other studies, where most cases were diagnosed with fewer than five nerves affected[23–24].

The predominant mode of hansen's disease case detection was through the identification of "new cases," suggesting that most were identified via referrals and spontaneous demand, similar to findings in Goiânia between 2015 and 2018[25]. Regarding the therapeutic regimen of choice, there was a predominance of multidrug therapy (MDT) for multibacillary cases, in accordance with the PCDT guidelines, which recommend treatment for up to nine doses[2].

A discrepancy was observed between operational classification, number of lesions, clinical form, and therapeutic regimen. It is important to note that multibacillary cases cannot be classified as indeterminate or tuberculoid, nor should they present with only up to five skin lesions. Similarly, paucibacillary cases should not be defined as borderline or lepromatous, nor should they present with six or more skin lesions[2]. This study identified inconsistencies in this regard.

However, when analyzing the therapeutic regimen of choice, a predominance of MDT with up to nine doses was observed, which corresponds to the most prevalent initial classification. This finding suggests potential issues in the diagnostic process, the completion of notification forms, or the entry of data into SINAN, highlighting the urgent need for continuous training of health professionals in the clinical assessment of the disease.

This study indicates that, in the state of Amazonas, the Southern Mesoregion recorded the highest rates of hansen's disease notifications. The North, Northeast, and Central-West regions of Brazil present the highest prevalence rates of hansen's disease, representing the most vulnerable areas in the country[26],[11]. In Latin America, a study conducted between 2011 and 2020 identified Brazil as the only country with a prevalence rate greater than 1 per 10,000 inhabitants,

with the highest incidence recorded at 1.36 per 10,000 inhabitants[20]. A World Health Organization (WHO) study involving 143 countries revealed that only Brazil, India, and Indonesia accounted for the highest number of new cases in 2021[27].

The high incidence of hansen's disease in Brazil is justified by factors that contribute to the emergence and transmission of the disease. These include its predominant spread among socially vulnerable populations, linked to unfavorable socioeconomic conditions such as low income, inadequate housing, overcrowded living conditions, and nutritional deficiencies—factors that increase susceptibility to hansen's disease [28].

A decrease in notification rates was observed in 2020 and 2021, corresponding to the COVID-19 pandemic period in Brazil. This phenomenon was not exclusive to the state but reflects a 40% reduction in hansen's disease detection in 2020 compared to the five-year average[29]. A similar trend was observed in other Latin American countries in 2020[20]. With the onset of the COVID-19 pandemic in Brazil, the healthcare system faced significant challenges[30], including underreporting of cases, reduced access to treatment, and increased disease complications, especially in remote areas[28].

The state of Amazonas covers a vast territorial area, with socioeconomic development and healthcare services concentrated in the capital and metropolitan region, resulting in significant inequalities in addressing health issues. The social vulnerability and sociodemographic characteristics discussed in this analysis are generally associated with individuals affected by the disease, reaffirming the notion of a predominantly clinical profile in poor populations.

This study, based on secondary data, presents as a limitation the potential for information bias due to the incomplete reporting of sociodemographic variables ("Pregnancy status," "Race," and "Education level") and clinical variables ("Clinical form," "Disability grade," "Number of lesions," and "Number of nerves affected"), indicating a lack of completeness in the notification forms and possible underreporting by municipalities—especially during the COVID-19 pandemic in the years 2020 and 2021.

FINAL CONSIDERATIONS

It can be concluded that it is crucial to strengthen hansen's disease investigation by healthcare teams, especially within Primary Care. The promotion of continuing education initiatives is necessary to clarify doubts regarding diagnosis—particularly concerning the operational classification of the disease, accurate assessment of affected nerves, and the degrees

of disability that may develop. These actions are essential to ensure that the chosen treatment is effective in curing patients, while also preventing the progression of the disease from milder to more severe forms.

It is important to highlight the need for proper training in the accurate completion of notification forms, as there are often missing data across various variables in epidemiological studies. Improving the quality of the collected data will result in greater efficacy in case reporting, especially in municipalities that did not register any cases in the analyzed sample.

Thus, investing in continuous education for Primary Care professionals not only strengthens early diagnosis and appropriate treatment of hansen's disease but also contributes significantly to disease control and the reduction of its incidence—positively impacting public health and the well-being of the population.

ACKNOWLEDGMENTS:

"This study was funded by the Coordination for the Improvement of Higher Education Personnel (CAPES) – Project No.: PROAP/CAPES – Process Number: 88881.695908/2022-01."

REFERENCES

[1]Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância das Doenças Transmissíveis. Guia prático sobre a hanseníase. Brasília: Ministério da Saúde; 2017.

[2]Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Boletim Epidemiológico - Hanseníase 2023. Número Especial. Brasília: Ministério da Saúde; 2023.

[3]Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Doenças de Condições Crônicas e Infecções Sexualmente Transmissíveis. Protocolo Clínico e Diretrizes Terapêuticas da Hanseníase. Secretaria de Ciência, Tecnologia, Inovação e Insumos Estratégicos em Saúde. Brasília: Ministério da Saúde; 2022.

[4]Ferreira LM, *et al*. Hanseníase na Amazônia central: um olhar epidemiológico. Rev Med (São Paulo). 2023;102(2):e-194245. https://doi.org/10.11606/issn.1679-9836.v102i2e-194245

[5]Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Coordenação-Geral de Desenvolvimento da Epidemiologia em Serviços. Guia de Vigilância em Saúde : volume único [recurso eletrônico]. 3ª ed. Brasília: Ministério da Saúde; 2019.

[6]Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Doenças de Condições Crônicas e Infecções Sexualmente Transmissíveis. Estratégia Nacional para Enfrentamento da Hanseníase 2019-2022. Brasília: Ministério da Saúde; 2019.

[7]Brasil. Ministério da Saúde. Informações de saúde: Tabnet. Demográficas e socioeconômicas 2018 a 2021 [Internet]. 2021 [acessado em 15 jul. 2023]. Disponível em: http://tabnet.datasus.gov.br/cgi/deftohtm.exe?ibge/cnv/popsvsbr.def

[8]Instituto Brasileiro de Geografia e Estatística (IBGE). Censo Brasileiro de 2022. Rio de Janeiro: IBGE; 2022.

[9]Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância das Doenças Transmissíveis. Diretrizes para vigilância, atenção e eliminação da Hanseníase como problema de saúde pública: manual técnico-operacional. Brasília: Ministério da Saúde; 2016.

[10]Oliveira MB, Diniz LM. Leprosy among children under 15 years of age: literature review. An Bras Dermatol. 2016;91:196-203. https://doi.org/10.11606/issn.1679-9836.v102i2e-194245

[11]Santos MB, Santos MLR, Monteiro LD, Heukelbach J, Nobre ML. Clinical and epidemiological indicators and spatial analysis of leprosy cases in patients under 15 years old in an endemic area of Northeast Brazil: an ecological and time series study. BMJ Open. 2019a;9(7):e023420. https://doi.org/10.1136/bmjopen-2018-023420

[12]Oliveira JSS, Souza CD, Silva JCF, Goulart IMB, Goulart LR, Santos M. Leprosy in elderly people and the profile of a retrospective cohort in an endemic region of the Brazilian Amazon. PLoS Negl Trop Dis. 2019;13(9):e0007709. https://doi.org/10.1371/journal.pntd.0007709

[13]Dharmawan Y, Fuady A, Korfage I, Richardus JH. Individual and community factors determining delayed leprosy case detection: A systematic review. PLoS Negl Trop Dis. 2021;15(8):e0009651. https://doi.org/10.1371/journal.pntd.0009651

[14]Palácios VR, Mendes LL, Dias J, Moraes TM, Ignotti E, Paula S. Leprosy and pregnancy: detection coefficient and proposal for a new index. Rev Soc Bras Med Trop. 2014;47:798-800. https://doi.org/10.1590/0037-8682-0019-2013

[15]Santos KCB, Freitas LAR, Barreto JG, Goulart IM, Goulart LR. Estratégias de controle e vigilância de contatos de hanseníase: revisão integrativa. Saúde em Debate. 2019b;43:576-591. https://doi.org/10.1590/0103-1104201912122

[16]Nery JS, Pescarini JM, Mendes JM, Ichihara MY, de Araújo GS, Santana SR, *et al*. Socioeconomic determinants of leprosy new case detection in the 100 Million Brazilian Cohort: a population-based linkage study. The Lancet Global Health. 2019;7(9):e1226-e1236. http://dx.doi.org/10.1016/ S2214-109X(19)30260-8

[17]Ramos AC, Yamamura M, Arroyo LH, Popolin MP, Neto FC, Palha PF, *et al*. Spatial clustering and local risk of leprosy in São Paulo, Brazil. PLoS Negl Trop Dis. 2017;11(2):e0005381. https://doi.org/10.1371/journal.pntd.0005381

[18]Lopes FC, Rodrigues RN, Castro CGJ, Andrade RV, Grilo LS, Costa DA, *et al*. Hanseníase no contexto da Estratégia Saúde da Família em cenário endêmico do Maranhão: prevalência e

fatores associados. Ciênc Saúde Coletiva. 2021;26(5):1805-1816. https://doi.org/10.1590/1413-81232021265.04032021.

[19]Sales BN, Ribeiro Neto AG, Silva PRP, Ferreira Júnior AM, Pinto IC. Caracterização epidemiológica da hanseníase nas regiões Norte e Nordeste do Brasil. Res Soc Dev. 2020;9(8):e894986313. http://dx.doi.org/10.33448/rsd-v9i8.6313

[20]Cáceres-Durán MA. Comportamiento epidemiológico de la lepra en varios países de América Latina, 2011-2020. Rev Panam Salud Publica. 2023;46:e14. https://doi.org/10.26633/RPSP.2022.14

[21]Pescarini JM, Strina A, Nery JS, Skalinski LM, Andrade KVF, Penna MLF, *et al*. Epidemiological characteristics and temporal trends of new leprosy cases in Brazil: 2006 to 2017. Rev Saude Publica. 2021;37(7):e0013002. https://doi.org/10.1590/0102-311X00130020

[22]Silva JSR, Palmeira IP, Sá AMM, Nogueira LMV, Ferreira AMR. Variáveis clínicas associadas ao grau de incapacidade física na hanseníase. Rev Cuid. 2019;10(1):e618. https://doi.org/10.15649/cuidarte.v10i1.618

[23]Serra MAAO, Furtado JP, Gonçalves FG, Santos FG, Peixoto LMB, Alencar CH. Factors associated with multibacillary leprosy in a priority region for disease control in northeastern Brazil: a retrospective observational study. J Trop Med. 2019;2019:5738924. https://doi.org/10.1155/2019/5738924

[24]Pêgo AF, Eleutério D, Procópio JPM, Condé VAS, Gonçalves E. Hanseníase: correlação entre o número de lesões hansênicas, nervos afetados e o diagnóstico precoce no estado de Minas Gerais. Rev Eletr Acervo Saude. 2020;12(9):e2188. https://doi.org/10.25248/reas.e2188.2020

[25]Espíndola MF, Santos FL, Silva RC, Oliveira VS, Silva JF, Reis RM, *et al*. Perfil epidemiológico da hanseníase no período de 2015 a 2018 no município de Goianésia (GO) Perfil epidemiológico da hanseníase em Goianésia, Goiás. Braz J Health Rev. 2020;3(2):2600-2611. https://doi.org/10.34119/bjhrv3n2-107

[26]Cunha C, Vianna L, Marrero L, Cardoso M, Souza I, da Costa AM, *et al*. A historical overview of leprosy epidemiology and control activities in Amazonas, Brazil. Rev Soc Bras Med Trop. 2015;48:55-62. https://doi.org/10.1590/0037-8682-0103-2013

[27]Health Health Organization (WHO). Global leprosy (Hansen disease) update, 2021: moving towards interruption of transmission. Wkly Epidemiol Rec. 2022;97:429-50.

[28]Paz WS, Santos FQ, Nogueira LS, Souza BD, Silva RC, Duarte NC, *et al*. Impact of the COVID-19 pandemic on the diagnosis of leprosy in Brazil: An ecological and population-based study. Lancet Reg Health Am. 2022;9:100181. https://doi.org/10.1016/j.lana.2021.100181

[29]Deps P, Collin SM, de Andrade VLG. Hansen's disease case detection in Brazil: a backlog of undiagnosed cases due to COVID-19 pandemic. J Eur Acad Dermatol Venereol. 2022;36(5):e339-e340. https://doi.org/10.1111/jdv.18307

[30]Schmitz V, Santos JB. COVID-19, leprosy, and neutrophils. PLoS Negl Trop Dis. 2021;15(1):e0009019. https://doi.org/10.1371/journal.pntd.0009019

Submitted: December 21, 2023

Accepted: December 19, 2024

Published: April 10, 2025

Authors' Contributions:

Débora Oliveira Marques: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Supervision; Visualization; Writing – original draft; Writing – review and editing.

Eduarda Cândida Gomes Aguiar: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Resources; Supervision; Visualization; Writing – original draft; Writing – review and editing.

Keven de Oliveira Cosme: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Resources; Supervision; Visualization; Writing – original draft; Writing – review and editing.

Yone Almeida da Rocha: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Resources; Supervision; Visualization; Writing – original draft; Writing – review and editing.

Nathália França de Oliveira: Data curation; Formal analysis; Methodology; Resources; Visualization.

All the authors have approved the final version of the text.

Conflict of interest: There is no conflict of interest.

Corresponding author:

Débora Oliveira Marques

State University of Amazonas

Av. Carvalho Leal, 1777 – Cachoeirinha, Manaus/AM, Brazil. CEP 69065-001

oliveiradeboramarques@gmail.com

Editor: Amanda Silva dos Santos Aliança. PhD

Editor-in-chief: Adriane Cristina Bernat Kolankiewicz. PhD