







## Magnitude of reactional episodes in leprosy in a specialized outpatient service

### Magnitude dos episódios reacionais na hanseníase em serviço ambulatorial especializado

### Magnitud de los episodios reaccionales en lepra en un servicio ambulatorio especializado

André Felipe de Castro Pereira Chaves <sup>1</sup>, Olívia Dias de Araújo <sup>2</sup>, Ellen Cristina da Costa Leite Sousa <sup>3</sup>, Jonas Alves Cardoso <sup>4</sup>, Érica de Alencar Rodrigues <sup>5</sup>, Edmércia Holanda Moura <sup>6</sup>

<sup>1</sup> Graduating Student, Federal University of Piauí, Nursing Department, Teresina, Piauí, Brazil.

<sup>2</sup> PhD, Federal University of Piauí, Nursing Department, Teresina, Piauí, Brazil.

<sup>3</sup> Graduating Student, Federal University of Piauí, Nursing Department, Teresina, Piauí, Brazil.

<sup>4</sup> MSc, Federal University of Piauí, Post-graduation Program in Nursing, Teresina, Piauí, Brazil.

<sup>5</sup> PhD Student, Federal University of Piauí, Post-graduation Program in Nursing, Teresina, Piauí, Brazil.

<sup>6</sup> MSc, Federal University of Piauí, Post-graduation Program in Women's Health, Teresina, Piauí, Brazil.

#### HOW TO CITE:

Chaves AFCP, Araújo OD, Sousa ECCL, Cardoso JA, Rodrigues EA, Moura EH. Magnitude of reactional episodes in leprosy in a specialized outpatient service. *Hansen. Int. Hansen int.* 2022;47:1-12.

doi: <https://doi.org/10.47878/hi.2022.v47.37318>

#### CORRESPONDING AUTHOR:

André Felipe de Castro Pereira Chaves.  
Federal University of Piauí.  
e-mail: [andre\\_cchavez14@hotmail.com](mailto:andre_cchavez14@hotmail.com)

RECEIVED IN: 02/26/2022

ACCEPTED IN: 08/12/2022

PUBLISHED IN: 11/21/2022

## ABSTRACT

The goal of this study is to characterize reactional episodes according to sociodemographic, clinical, and epidemiological data of patients with leprosy in a hyperendemic municipality in Piauí state, Brazil, from 2013 to 2017. For this purpose, a descriptive, cross-sectional, and retrospective study used leprosy cases, reported in the Notification Diseases Information System (SINAN), along with a medicine dispensation form of the study site. Univariate analyses were performed, through simple descriptive statistics, and bivariate analysis, using Pearson's Chi Square to associate quantitative variables with the response variable of the study, which is the moment of leprosy reaction. Statistical significance was fixed in  $p < 0.05$ . It was

observed that most of the reactional episodes occurred during leprosy treatment. Men, browns, people with complete or incomplete primary education, masons, urban dwellers, dimorphic individuals, and multibacillary individuals with the presence of degree 0 of physical disability, predominated in the emergence of reaction. Type 1 reaction prevailed, followed by type 2 reaction, and, lastly, mixed reactions. That said, it is understood that individual, social, and economic vulnerabilities directly impact the development of leprosy reactions.

**Keywords:** *Leprosy Reactions. Disabled People. Health Vulnerability. Social Vulnerability.*

## RESUMO

O objetivo do estudo é caracterizar os episódios reacionais segundo os dados sociodemográficos, clínicos e epidemiológicos de pacientes com hanseníase em um município hiperendêmico do estado do Piauí, Brasil, no período de 2013 a 2017. Para tanto, um estudo descritivo, transversal e retrospectivo utilizou-se os casos de hanseníase, notificados no Sistema de Informação de Agravos de Notificação (SINAN), juntamente com a ficha de dispensação de medicamentos do local em estudo. Foram realizadas análise univariada, por meio de estatística descritiva simples, e análise bivariada, utilizando o Qui-quadrado de Pearson para associar as variáveis quantitativas com a variável resposta do estudo, que é o momento da reação hansênica. A significância estatística foi fixada em  $p < 0,05$ . Observou-se que a maioria dos episódios reacionais ocorreram durante o tratamento para hanseníase. Homens, pardos, pessoas com ensino fundamental completo ou incompleto, pedreiros, moradores da zona urbana, indivíduos dimorfos, multibacilares e com presença de grau 0 de incapacidade física, predominaram no aparecimento de reação. A reação que prevaleceu foi a do tipo 1, seguida pelo tipo 2, e em última, a reação mista. Diante disso, compreende-se que as vulnerabilidades individuais, sociais e econômicas impactam diretamente no desenvolvimento de reação hansênica.

**Palavras-chave:** *Reações Hansênicas. Pessoas com Deficiência. Vulnerabilidade em Saúde. Vulnerabilidade Social.*

## RESUMEN

El objetivo del estudio es caracterizar los episodios reacciones según datos sociodemográficos, clínicos y epidemiológicos de los pacientes con lepra en un municipio hiperendémico del estado de Piauí, Brasil, en el período de 2013 a 2017. Se realizó análisis univariado mediante estadística descriptiva

simple y análisis bivariado, utilizándose Chi-cuadrado de Pearson para asociar las variables cuantitativas con la variable respuesta del estudio, que es el momento de la reacción leprosa. La significación estadística se fijó en  $p < 0,05$ . Se observó que la mayoría de los episodios de reacción ocurrieron durante el tratamiento de la lepra. Los hombres, pardos, personas con educación primaria, ya sea completa o incompleta, albañiles, residentes de la zona urbana, individuos dimórficos, multibacilares y con presencia de grado 0 de discapacidad física, fueron los que predominaron en la aparición de reacción. La reacción que predominó fue la de tipo 1, seguida de la de tipo 2 y finalmente la reacción mixta. Ante ello, se entiende que las vulnerabilidades individuales, sociales y económicas impactan directamente en el desarrollo de la reacción leprosa.

**Palabras clave:** Reacciones de la Lepra. Personas con Discapacidad. Vulnerabilidad en Salud. Vulnerabilidad Social.

## INTRODUCTION

Leprosy is a contagious, chronic disease, caused by a bacillus capable of infecting a great number of individuals (highly contagious), but only a few get sick (low pathogenicity)<sup>1</sup>.

Besides, leprosy may present periods of immune alterations, or reactional states. These reactions may occur before, during or after multidrug treatment (MDT), and are characterized by: type 1 reaction or reversal reaction (RR) and type 2 reaction or erythema nodosum leprosum (ENL). People affected by leprosy may, yet, present mixed reactions, ie, type 1 and 2 reactions at the same time, and erythema multiforme reactions<sup>2</sup>.

Leprosy reactions can be the biggest complication in these patients and are the main cause of physical disabilities and permanent disabilities<sup>3</sup>.

Around the globe, 208,619 new cases of this disease were reported to the World Health Organization (WHO) in 2018. Of these, 30,957 occurred in the Americas and 28,660 (92.6% of the Americas total) were reported in Brazil<sup>4</sup>. Piauí, a leprosy endemic area, presented in 2017, a prevalence rate of 3.16/100,000 inhabitants, and an overall detection rate of 33.27/100,000 inhabitants, indicators that were higher than those observed nationwide<sup>5</sup>.

Teresina city, capital of Piauí, notified between the years of 2013 and 2016, 1,513 new cases of leprosy, which corresponds to approximately 36.60% of all cases notified in Piauí state (4,133 cases). In this last year of analysis, 331 new cases were notified, which represents a detection coefficient corresponding to 38.85, configuring the municipality as a region of high incidence. Grade 2 coefficient of physical disability (GIF), in 2016, was 1.76, which was considered low<sup>6</sup>.



Due the lack of control sheets registering reactional episodes, it is not possible to define the number of individuals who present a reaction. This reality doesn't only happen in the municipality of study, it happens in many Brazilian municipalities, since there is no national form for reporting and monitoring these cases.

In this context, the aims of this study is to characterize the reactional episodes according to sociodemographic, clinical and epidemiological data of patients with leprosy in a hyperendemic municipality in the state of Piauí, from 2013 to 2017.

## **METHODOLOGY**

### **Study Design**

Descriptive, cross-sectional and retrospective study. The data used were from leprosy cases notified in the Notification Diseases Information System (SINAN) database, provided through TABWIN program.

### **Place of study**

The study was carried out in the city of Teresina, capital of Piauí. Data were collected considering the period from 2013 to 2017.

### **Study participants**

Participants of this study were people with leprosy, residing in the city of Teresina, between years 2013 and 2017 (n = 2233). It was used as inclusion criteria being a resident of Teresina, not considering the age group. Meanwhile, the exclusion criteria were incompleteness and duplicity of data.

### **Study variables**

Variables used were gender, ethnic group, education, occupation, area of residence, operational classification, clinical form, degree of physical disability and reaction type.

### **Study size**

To find the location where individuals had a reaction before and after treatment, the service's medicine dispensation form was used. From this, it was possible to identify all patients who were under treatment with prednisone

and thalidomide, or even those discharged from treatment during the period between 2013 and 2017.

Through the date of notification by SINAN and the date of the first medicine dispensation, it was possible to locate the individuals who had a reaction before and after treatment.

It should be noted that SINAN already provides a list of individuals with reactions during treatment, therefore, it is not necessary to use the dispensation worksheet to locate these people.

## Statistical methods

Univariate analyses were carried out using simple descriptive statistics, with distribution of absolute frequencies and simple percentages.

In the bivariate analysis, Pearson's chi-square test ( $X^2$ ) was used to associate clinical and epidemiological variables with the study response variable, which is the moment of the leprosy reaction. Statistical significance was set at 5% ( $p < 0.05$ ).

## Ethical considerations

The study followed the principles of Resolution 466 of December 12, 2012, of the National Health Council, which regulates research involving human beings. Since secondary data were used, and there was no identification of patients, the Free and Informed Consent Term was waived from this study. The project was approved by the Research Ethics Committee (RECs) of Federal University of Piauí, under legal opinion No. 2753958.

## RESULTS

In the universe of 2,233 people notified with leprosy by SINAN, from 2013 to 2017, living in the city of Teresina, a total of 392 people was diagnosed with leprosy reaction. From this sample, most of them developed the episode during treatment ( $n = 240$ ), followed by reaction before treatment ( $n = 109$ ), and, lastly, reaction after treatment ( $n = 43$ ).

According to Table 1, it was possible to observe that male was the gender most manifested reactions in all three moments ( $n = 251$ ). Brown people were the most affected with leprosy reactions, before, during and after treatment ( $n = 267$ ). Regarding education, leprosy reaction was most noticed, in all moments, in people with primary level of education ( $n = 225$ ). Most cases were notified in the urban area of residence ( $n = 286$ ). Regarding occupation,

masons (n = 42), other (n = 115) and not informed (n = 193) were the most prevalent.

**Table 1** – Distribution of leprosy reaction according to sociodemographic characteristics of study participants (n = 392). Teresina, Piauí, Brazil, 2013-2017.

Variables	Before treatment (109)		During treatment (240)		After treatment (43)	
	n	%	n	%	n	%
<b>Gender</b>						
Female	40	36.70	87	36.25	14	32.56
Male	69	63.30	153	63.75	29	67.44
<b>Ethnic group</b>						
White	15	13.76	35	14.58	4	9.30
Black	14	12.84	33	13.75	12	27.91
Brown	76	69.72	166	69.17	25	58.14
Indigenous	1	0.92	–	–	–	–
Unknown	3	2.75	6	2.50	2	4.66
<b>Education</b>						
None	10	9.17	30	12.50	6	13.95
Middle school	62	56.88	139	57.92	24	55.81
High school	25	22.94	47	19.58	9	20.93
College education	3	2.75	14	5.83	2	4.65
Unknown	9	8.26	10	4.17	2	4.65
<b>Area of Residence</b>						
Urban	108	99.08	236	98.33	42	97.67
Rural	1	0.92	4	1.67	1	2.33
<b>Occupation</b>						
Mason	10	9.17	27	11.25	5	11.63
Housekeeper	7	6.42	7	2.92	3	6.98
Retailer	4	3.67	10	4.17	3	6.98
Merchant	2	1.83	5	2.08	1	2.33
Other	30	27.52	73	30.42	12	27.91
Not informed	56	51.38	118	49.17	19	44.19

Source: Elaborated by the authors

Regarding clinical form, dimorphics form was more present in individuals with leprosy reaction, both before and during treatment (n = 152), while episodes after treatment occurred more frequently in people with Virchowian form (n = 18).

As for operational classification, multibacillary individuals were the ones who presented the most reactions ( $n = 327$ ).

Among reaction types, the most affected patients were those who had a type 1 reaction ( $n = 279$ ). Lastly, evaluating the grade of physical disability, it was noticed that reactional episodes occurred in greater prevalence in individuals who had grade 0 of physical disability ( $n = 233$ ).

None of the clinical and epidemiological variables showed a statistical relationship ( $p < 0.005$ ) with the moment of leprosy reaction (Table 2).

**Table 2** – Association between the presence of a reactional episode and clinical and epidemiological characteristics of study participants ( $n = 392$ ). Teresina, Piauí, Brazil, 2013-2017.

Variables	Moment of reaction						P-value
	Before treatment (109)		During treatment (240)		After treatment (43)		
	n	%	n	%	n	%	
<b>Clinical form</b>							<b>0.128</b>
Indeterminate	8	7.34	12	5.00	4	9.30	
Tuberculoid	14	12.84	21	8.75	2	4.65	
Dimorphics	40	36.70	112	46.67	17	39.53	
Virchowian	37	33.94	63	26.25	18	41.86	
Unclassified	10	9.17	32	13.33	2	4.65	
<b>Operational classification</b>							<b>0.188</b>
Paucibacillary	24	22.02	34	14.17	7	16.28	
Multibacillary	85	77.98	206	85.83	36	83.72	
<b>Types of reaction</b>							<b>0.213</b>
Type 1	85	77.98	161	67.08	33	76.74	
Type 2	18	16.51	54	22.50	8	18.60	
Types 1 and 2	6	5.50	25	10.42	2	4.65	
<b>Grade of physical disability</b>							<b>0.928</b>
Grade 0	63	57.80	143	59.58	27	62.79	
Grade 1	25	22.94	54	22.50	9	20.93	
Grade 2	12	11.01	31	12.92	5	11.63	
Not evaluated	9	8.26	12	5.00	2	4.65	

Source: Elaborated by the authors

## DISCUSSION

The study demonstrated a predominance of episodes during treatment, followed by reactions before and after treatment. These results were according

with results of studies carried out in the northern region. According to this, most of these cases remained with a reaction until the end of treatment, while a small amount developed more than one episode<sup>7</sup>.

Males were more affected by these episodes than females; this is in line with studies carried out in other Brazilian states<sup>8-9</sup>. Considering that life expectancy of women, since adolescence, is greater than life expectancy of men, the greater proportion of leprosy reactions in men may be a characteristic of the disease.

Among patients affected by a reactional episode, the brown race prevailed as the most affected one. This parameter was according with the study carried out by Sousa, however, it differs from the study carried out by Queiroz<sup>11</sup>. In Brazilian territory, the difference between income indicators and access to services is notorious when comparing browns/blacks and whites. This scenario of composition of racism is also notable in the care and assistance provided to these people<sup>12</sup>.

In terms of education, people with primary education were the most affected ones, followed by people with secondary education, and, lastly, by individuals with no education. These data reveal the importance of clear and adequate guidelines for their degree of comprehension, due their difficulty in understanding and/or carrying out some care practice<sup>11</sup>.

Patients who lived in urban areas were the most affected ones – presenting reactions – when compared to those who lived in rural areas. The fact of living in the urban region confers, in theory, better access to health services, evaluation and treatment<sup>10</sup>.

Occupation is an important variable when characterizing patients with leprosy. As a result, there was a predominance of reactions being triggered in masons, followed by domestic workers, resellers and traders. Therefore, it is pertinent to infer that the attention to users who present a reaction needs an action between several sectors, such as political, economic and social, aiming to promote health among population through the supply of needs that directly affect health care process/disease<sup>13</sup>.

The predominant clinical form in reactions before and during treatment was the dimorphous one, while after treatment Virchowian form was predominant. In operational classification, multibacillary individuals were the ones who most presented a reactional episode. In multibacillary cases, dead bacilli are eliminated and, therefore, the continuous presence of their antigens increases the risk of leprosy reactions<sup>14</sup>.

Patients with indeterminate type of leprosy also had a reaction. These people may have been diagnosed with this clinical form and, during treatment, may have evolved into multibacillary form<sup>8</sup>.

Type 1 reaction was the most predominant, when compared with type 2 and mixed reactions, and these findings are in line with the study carried



out in the city of Belém – PA<sup>15</sup>. RR generates the greatest organic and social damage, due its characteristic of producing an acute condition with pain and the possibility of neural damage, disabling the individual to do his work activities, causing recurrent sick leaves and consequent unemployment<sup>16-17</sup>.

Regarding physical disability degree (GIF), most patients presented grade zero GIF. These data are similar to those registered in a city in the interior of Piauí<sup>11</sup> and in the capital of same state<sup>18</sup>. Considering the occurrence of reactional episodes can lead to the surge of physical disabilities, in some irreversible cases, Brazilian Ministry of Health established the need to assess the integrity degree of neural function of patients diagnosed with leprosy. Inspection, palpation and functional assessment of specific regions of patient's body will identify the presence of physical disabilities<sup>19</sup>.

Despite being a secondary reference, 23 individuals were not evaluated, revealing a programmatic vulnerability, which can trigger an increase in leprosy's sequelae. Considering the existence of effective diagnostic methods for leprosy, as well as the availability and effectiveness of MDT, operational failures at different points in health care network have played a significant role in the persistence of high endemicity<sup>20-21</sup>.

## Study limitations

As a study limitation, the fact that there is no specific document for notifying reactional episodes in the study establishment stands out, which is solved by crossing the data obtained by SINAN with the medication dispensing form, provided by the same place.

Therefore, it is necessary to develop and standardize, at a national level, a specific instrument for notifying reactional episodes.

## CONCLUSIONS

Most of leprosy reactions occurred during leprosy treatment, followed by reactions before and after treatment. Most individuals developed type 1 reaction, with predominance of physical disability grade 0 in the moment of diagnosis.

In view of this, it is extremely necessary to monitor patients affected by leprosy. Evaluation, early diagnosis of leprosy and reactions, and health education are important actions to avoid physical disabilities and improve people's quality of life.

**CONFLICTS OF INTEREST:** *There are no conflicts of interest in this manuscript.*

## REFERENCES

1. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Coordenação-Geral de Desenvolvimento da Epidemiologia em Serviços. Guia de vigilância em saúde. 3 ed. Brasília: Ministério da Saúde; 2019. [cited 10 fev. 2022]. Available from: [https://bvsmms.saude.gov.br/bvs/publicacoes/guia\\_vigilancia\\_saude\\_3ed.pdf](https://bvsmms.saude.gov.br/bvs/publicacoes/guia_vigilancia_saude_3ed.pdf).
2. Polycarpou A, Walker SL, Lockwood DNJA. Systematic review of immunological studies of erythema nodosum leprosum. *Front Immunol* [internet]. 2017 Mar. 13 [cited 2022 Feb. 22];(8):233. Available from: <https://pubmed.ncbi.nlm.nih.gov/28348555/>.
3. Pires CAA, Jucá Neto FO, de Albuquerque NC, Macedo GMM, Batista KNM, Xavier MB. Leprosy reactions in patients coinfecting with HIV: clinical aspects and outcomes in two comparative cohorts in the Amazon Region, Brazil. *PLoS Negl Trop Dis*. 2015 jun. 1;9(6):1-14. doi: <https://doi.org/10.1371/journal.pntd.0003818>.
4. World Health Organization. Leprosy [Internet]. Genebra: WHO; [2019 Sep. 10]. [cited 2021 Feb. 08]. Available from: <https://www.who.int/en/news-room/fact-sheets/detail/leprosy>.
5. Ministério da Saúde (BR). Situação epidemiológica-dados [Internet]. Brasília: Ministério da Saúde; 2018 [cited 10 set. 2019]. Available from: <http://antigo.aids.gov.br/pt-br/hanseníase/situacao-epidemiologica>.
6. Federal University of Piauí, IntegraHans PI. Boletim de vigilância em saúde do Estado do Piauí: hanseníase 2016. [Internet]. Teresina: Universidade Federal do Piauí; [2018]. [cited 08 fev. 2021]. Available from: [https://www.researchgate.net/publication/324068070\\_Boletim\\_de\\_vigilancia\\_em\\_saude\\_do\\_estado\\_do\\_Piaui\\_hanseníase\\_2016\\_-\\_IntegraHans](https://www.researchgate.net/publication/324068070_Boletim_de_vigilancia_em_saude_do_estado_do_Piaui_hanseníase_2016_-_IntegraHans).
7. Monteiro LD, Alencar CHM, Barbosa JC, Braga KP, Castro MD, Heukelbach J. Incapacidades físicas em pessoas acometidas pela hanseníase no período pós-alta da poliquimioterapia em um município no Norte do Brasil. *Cad. Saúde Pública*. 2013 [cited 11 jul. 2022];29(5):909-20. Available from: <https://www.scielosp.org/article/csp/2013.v29n5/909-920/>.
8. Silva KR, Lopes WMPS, Costa JJ. Clinical and epidemiological profile of leprosy reactions. *Rev Enferm UFPI* [Internet]. 2019 [cited 2022 Feb. 10];8(3):48-54. Available from: <https://ojs.ufpi.br/index.php/reufpi/article/view/8141/pdf>.



9. Ambrosano L, Machado ECFA, Santos MAS, Pegas ES. Epidemiological profile of leprosy reactions in a referral center in Campinas (SP), Brazil, 2010-2015. *An Bras Dermatol*. 2018;93(3):460-1. doi: <https://doi.org/10.1590/abd1806-4841.20187260>.
10. Sousa ALG. Episódios reacionais em pacientes acometidos pela hanseníase em município endêmico [dissertação]. [Internet]. Teresina: Universidade Federal do Piauí; 2018. [cited 09 fev. 2022]. 67p. Available from: [https://sigaa.ufpi.br/sigaa/public/programa/noticias\\_desc.jsf?lc=pt\\_BR&id=345&noticia=262466871](https://sigaa.ufpi.br/sigaa/public/programa/noticias_desc.jsf?lc=pt_BR&id=345&noticia=262466871).
11. Queiroz TA, Carvalho FPB, Simpson CA, Fernandes ACL, Figueirêdo DLA, Knackfuss MI. Perfil clínico e epidemiológico de pacientes em reação hansênica. *Rev Gaúcha Enferm*. 2015;36(esp):185-91. doi: <https://doi.org/10.1590/1983-1447.2015.esp.57405>.
12. Araújo OD. Vulnerabilidades relacionadas à hanseníase entre contatos/coabitantes e sua interface com a detecção de casos novos. [tese]. [Internet]. Teresina: Universidade Federal do Piauí; 2017. [cited 10 fev. 2022]. 224p. Available from: [https://sucupira.capes.gov.br/sucupira/public/consultas/coleta/trabalhoConclusao/viewTrabalhoConclusao.jsf?popup=true&id\\_trabalho=5020323](https://sucupira.capes.gov.br/sucupira/public/consultas/coleta/trabalhoConclusao/viewTrabalhoConclusao.jsf?popup=true&id_trabalho=5020323).
13. Brasil. Ministério da Saúde. Portaria nº 2.446, de 11 de novembro de 2014. Redefine a Política Nacional de Promoção da Saúde (PNPS). *Diário Oficial [da] República Federativa do Brasil*, Poder Executivo, Brasília, DF, 11 nov. 2014. Available from: [https://bvsms.saude.gov.br/bvs/saudelegis/gm/2014/prt2446\\_11\\_11\\_2014.html](https://bvsms.saude.gov.br/bvs/saudelegis/gm/2014/prt2446_11_11_2014.html). Acesso em: 12 fev. 2022.
14. Sousa ALM, Fava VM, Sampaio LH, Martelli CMT, Costa MB, Mira MT et al. Genetic and immunological evidence implicates interleukin 6 as a susceptibility gene for leprosy type 2 reaction. *J Infect Dis*. 2012;205(9):1417-24. doi: <https://doi.org/10.1093/infdis/jis208>.
15. Araújo MFS, Cunha MHCM, Xavier MB. Adesão ao tratamento de hanseníase em pacientes com episódios reacionais hansênicos em uma unidade de referência. *Rev Pan-Amaz Sal*. 2015;6(2):23-8. doi: <http://dx.doi.org/10.5123/S2176-62232015000200003>.
16. Foss NT. Episódios reacionais na hanseníase. *Medicina*. 2003;36(2/4):453-9. doi: <https://doi.org/10.11606/issn.2176-7262.v36i2/4p453-459>.



17. Sociedade Brasileira de Hansenologia. Sociedade Brasileira de Dermatologia. Hanseníase: episódios reacionais – projeto e diretrizes [Internet]. Belo Horizonte: Associação Médica Brasileira; 2003. [cited 10 fev. 2022]. 19p. Available from: [https://amb.org.br/files/\\_BibliotecaAntiga/hansenia-se-episodios-reacionais.pdf](https://amb.org.br/files/_BibliotecaAntiga/hansenia-se-episodios-reacionais.pdf).
18. Sousa PCG. Análise espacial da endemia hansênica em uma capital do nordeste. [dissertação]. [Internet]. Teresina: Universidade Federal do Piauí; 2016. [cited 09 fev. 2021]. 69 p. Available from: <https://repositorio.renasc.fiocruz.br/teses-e-dissertacoes/analise-espacial-da-endemia-hansenica-em-uma-capital-do-nordeste/>.
19. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Vigilância das Doenças Transmissíveis. Guia prático sobre a hanseníase. Brasília: Ministério da Saúde; 2017. [cited 09 fev. 2022]. Available from: [https://bvsmms.saude.gov.br/bvs/publicacoes/guia\\_pratico\\_hansenia-se.pdf](https://bvsmms.saude.gov.br/bvs/publicacoes/guia_pratico_hansenia-se.pdf).
20. Barbosa JC, Ramos Júnior NA, Alencar OM, Pinto MSP, Castro CGJ. Leprosy after release from treatment in the Brazilian Unified Health System: aspects for access in the Northeast region. *Cad Saúde Colet*. 2014;22(4):351-8. doi: <https://doi.org/10.1590/1414-462X201400040008>.
21. Noriega LF, Chiacchio ND, Noriega AF, Pereira GAAM, Vieira ML. Leprosy: ancient disease remains a public health problem nowadays. *An Bras Dermatol*. 2016;91(4):547-8. doi: <https://doi.org/10.1590/abd1806-4841.20164861>.

