

Leprosy in minors under 15: incidence and characteristics of reported cases in the State of Pará in the period 2005 to 2013

Etiane Prestes Batirola Alves¹, André Luiz Corrêa de Sousa², Kerlly Sandra Sousa Miyahara², Márcia Cristina dos Santos Guerra³, Katarine Antônia dos Santos Barile⁴, Daniele Melo Sardinha⁵

¹Master in Dentistry, Coordinator of the Dentistry Course at Metropolitan University Center of the Amazon (UNIFAMAZ). Belém, Pará, Brazil.

²Biomedical, Metropolitan University Center of the Amazon (UNIFAMAZ). Belém, Pará, Brazil.

³PhD student in Neurosciences and Cell Biology, Federal University of Pará (UFPA). Professor at the Metropolitan University Center of the Amazon (UNIFAMAZ). Belém, Pará, Brazil.

⁴PhD in Infectious and Parasitic Agent Biology. Coordinator of the Biomedicine Course of the Metropolitan University Center of the Amazon (UNIFAMAZ). Belém, Pará, Brazil.

⁵Master Student in Epidemiology and health Surveillance by Institute Evandro Chagas – PPGEVS (IEC/SVS/MS). Ananindeua, Pará, Brazil.

Corresponding author: Daniele Melo Sardinha

Timbó 1411A, pedreira, Belém, Pará, Brazil.

Abstract— *Objective: To describe the incidence and characteristics of leprosy in children under 15 years of age of the cases reported in the State of Pará, Brazil from 2005 to 2013. Method: The descriptive study, with a quantitative approach, was carried out based on data from the Acute Notification Information System, provided by the State Secretariat of Public Health. In the period studied, 4,251 cases of leprosy were reported in the state of Pará in children under 15 years of age, with an annual average of 472.3 cases/year. Results: There was a 15% decrease in the incidence of leprosy in the state, from 24% new cases/100 000 in 2005 to 20.4% new cases/100 000 in 2013. The year with the highest incidence of the disease was 2005 (24/100,000 inhabitants) and the year with the lowest incidence was 2010 (17.1/100,000 inhabitants); most cases were observed among men (52.2%) and individuals with brown skin color (68.9%), living in urban areas (72%), with indeterminate form (35.5%), followed by dimorph (30.1%), with most cases with negative smear (10.3%), zero degree of physical disability (79.5%) and with the appearance of single lesions (44.9%). 2,552 patients (60%) were classified as paucibacillary. Most of the investigated cases did not have nerves compromised by the disease (87.5%). Despite the decrease between the period studied, the incidence of leprosy in children under 15 in the state of Pará is still considered very high. Conclusion: It is necessary to decentralize the care of the disease carrier by implementing prevention activities (primary, secondary and tertiary) and control, training of family health strategy teams and more efficient coverage of health services.*

Keywords— *Leprosy; Mycobacterium leprae; Epidemiology; Minors.*

I. INTRODUCTION

Leprosy is a slowly evolving infectious disease caused by *Mycobacterium leprae*, which has tropism through the skin and peripheral nerves, being the only species that infects Schwann's cells (Silvestre & Lima, 2016). Its incubation period varies from 2 to 10 years, and the main transmission and contamination routes by the bacillus are the upper airways. The diagnosis is based on a classification that takes into account the patient's history

and living conditions, the number of skin lesions and clinical-laboratorial exams (Lastória & Abreu, 2012).

Among the examinations performed are a) dermato-neurological examination to identify lesions or areas of skin with altered sensitivity and/or involvement of peripheral nerves; and b) smear examination, which analyzes the intradermal scrape smear of suspected lesions or obtained from the ear, knee or elbow lobe, stained by

the Ziehl-Neelsen technique (Ministério da Saúde Brasil, 2010a).

Within clinical aspects, the disease causes skin blemishes with loss of local sensitivity and neural involvement. Currently there are three forms of classification of clinical manifestations of the disease: Madrid Classification, Ripley-Jopling Classification and the Operational Classification (C. S. Souza, 1997).

It stands out for early diagnosis, with the aim of starting therapy as soon as possible and preventing disabilities. Currently, the Operational Classification is adopted, which summarizes the clinical characteristics in: a) Multibacillary: patients with more than 5 lesions and/or more than one affected nerve trunk; patients with positive smear, regardless of the number of lesions and b) Paucibacillary: patients with up to 5 lesions and/or only one affected nerve trunk (C. F. D. Souza et al., 2010).

If left untreated, in the long run, the disease can generate anatomical and physiological deformities. Depending on the degree of deformity, leprosy may generate irreversible physical disabilities, i.e. permanent damage that may impede the basic and economically active functions of affected individuals (Sobrinho, Mathias, Gomes, & Lincoln, 2007).

Physical disabilities are classified in grades I and II: a) Grade I: loss of protective sensitivity (upper and lower limbs, eyes); b) Grade II: lagophthalm and/or ectropion, trichiasis, central corneal clouding and reduction of visual acuity, lesions on hands and feet (Haefner et al., 2017).

Due to these characteristics, in Brazil leprosy is considered a bill of review in the list of diseases that are compulsorily notifiable throughout the country and compulsory for research. All diagnosed cases must be notified through a notification and investigation form of the Aggravated Notification/Research Information System (SINAN)(Ministério da Saúde Brasil, 2016).

This rigour in leprosy surveillance is due to its great disabling potential, but is still recurrent in developing countries, such as Brazil, ranking second in absolute number of leprosy cases in the world, second only to India and concentrating 80% of cases on the American continent (Vieira, Aragoso, Carvalho, & Sousa, 2014).

For this reason, in the search for ways of eradicating this bill of review in its various federal units, the Ministry of Health (the highest body in the Brazilian Unified Health System) created the National Leprosy Programme and an Elimination Plan, in which it made a commitment to eliminate leprosy as a public health problem by the year 2015, with a target of reaching less

than 1 case per 10,000 inhabitants (Ministério da Saúde Brasil, 2010b).

Although there are specific public policies and records of continuing decreases in the prevalence and detection coefficients of new cases of leprosy, some regions still call for intensified action to eliminate the disease, this is the case in the North, Northeast and Centre-West regions (Ribeiro, Silva, & Oliveira, 2018).

The states of these regions most at risk for leprosy cases are: Mato Grosso, Pará, Maranhão, Rondônia, Tocantins and Goiás. These areas are justified by a pattern of high endemicity and are considered important in the maintenance of disease transmission, especially in the state of Pará, which ranks first in the national ranking of new cases of the disease (Magalhães & Rojas, 2007).

Data obtained from Sinan over the last ten years show that 50,491 cases were reported in Pará, of which 5,287 were new cases of the disease in children under 15 years of age, which draws the attention of health authorities because it is an indicator of active transmission circuits (Ministério da Saúde Brasil, 2017).

The appearance of the disease among children under 15 is related to the fact that they live in the same physical space as the bearer of the Hansen's bacillus for a long period of time. The carrier of the disease becomes a communicant, and it is essential to break the chain of transmission of the disease through early diagnosis and treatment (Freitas, Xavier, Cortela, & Ferreira, 2018).

In order to reduce this reality, the National Leprosy Control Programme (NLCP) of the Secretariat of Epidemiological Surveillance/Ministry of Health, adopts the reduction of cases in children under 15 as a priority, considering it an indicator of leprosy in PAC More Health (Brasil, 2010a).

SecondBrasil, (2010b), "The detection of cases in this age group is related to recent disease and active transmission outbreaks and its epidemiological follow-up is relevant for leprosy control.

In this sense, this article aims to describe the incidence of leprosy in children under 15 years of age and characterize the cases notified in the State of Pará from 2005 to 2013, and thus contribute to the surveillance of this bill of review in the Amazon region.

II. METHOD

This article is a descriptive, quantitative approach study carried out with data on reported leprosy cases in the State of Pará during the period 2005 to 2012. Data from the Acute Notification Information System (SINAN) and

the results of official statistical studies, provided by the Secretary of State for Public Health (SESPA).

The calculation of the incidence of leprosy per 100,000 inhabitants/year was based on the absolute resident population of the state, estimated by the Brazilian

Institute of Geography and Statistics Foundation (IBGE, 2010). And we consider the parameters established by the Ministry of Health in Chart 1 (Ministério da Saúde Brasil, 2009).

Chart 1 - Parameters inserted in the Programming of Priority Health Surveillance Actions to obtain epidemiological and operational indicators of leprosy in Brazil.

Detectioncoefficient in < 15 years	General population detectioncoefficient	% physical incapacity assessment	% assessment grade 2 of physical incapacity	% of contactsexami ned	% cure in cohorts
Hyperendemic: ≥ 10/100.000 hab.	Hyperendemic: ≥ 40/100.000 hab.	Good: ≥ 90%	High: ≥ 10%	Good: ≥ 75%	Good: ≥ 90%
Too high: 5 a 9/100.000 hab.	Too high: 20 a 39,99/100.000 hab.	Regular: 75 a 89,9%	Middle: 5 a 9,9%	Regular: 50 a 74,9%	Regular: 75 a 89,9%
High: 2,5 a 4,99/100.000 hab.	High: 10 a 19,99/100.000 hab.	Precariou: < 75%	Low: < 5%	Precariou: < 50%	< 75%
Middle: 0,5 a 2,49/100.000 hab.	Middle: 2 a 9,99/100.000 hab.	-	-	-	-
Low: < 0,5/100.000 hab.	Low: < 2/100.000 hab.	-	-	-	-

Fonte: Brasil (2009).

hab: Inhabitant.

The variables studied were the same as those considered by the Ministry of Health of the Sinan Leprosy Investigation and Notification Form:

- sex (male or female);
- race/color (brown, white, black, yellow or indigenous);
- residence area (urban or rural);
- clinical form of the disease (undetermined, tuberculoid, dimorphic or virchowian);
- classification of infection (paucibacillary or multibacillary); skin smear (positive or negative);
- degree of physical incapacity (degree 0, I or II);
- diagnosticyear;
- number of cutaneous lesions and nerves affected;

The descriptive analysis of the data was performed in Epi Info 3.5 and Microsoft Excel 2010

programs, and because it was secondary data in the public domain, the study did not need to be evaluated by the Research Ethics Committee according to the National Health Council Resolution number 466/2012 (Ministério da Saúde Brasil, 2012).

III. RESULTS

In the study period 2005-13, 4,251 cases of leprosy in children under 15 years of age were reported in the state of Pará. These results represent an annual average of 472.3 cases (standard deviation of 69.9 cases).

In the study period considered, there was a 15% decrease in the incidence of leprosy in the state, from 24% new cases/100,000 inhabitants in 2005 to 20.4% new cases/100,000 inhabitants in 2013.

The year with the highest incidence of the disease was 2005 (24/100,000 inhabitants) and the year with the lowest incidence was 2010 (17.1/100,000 inhabitants), according to Figure 1 and Table 1.

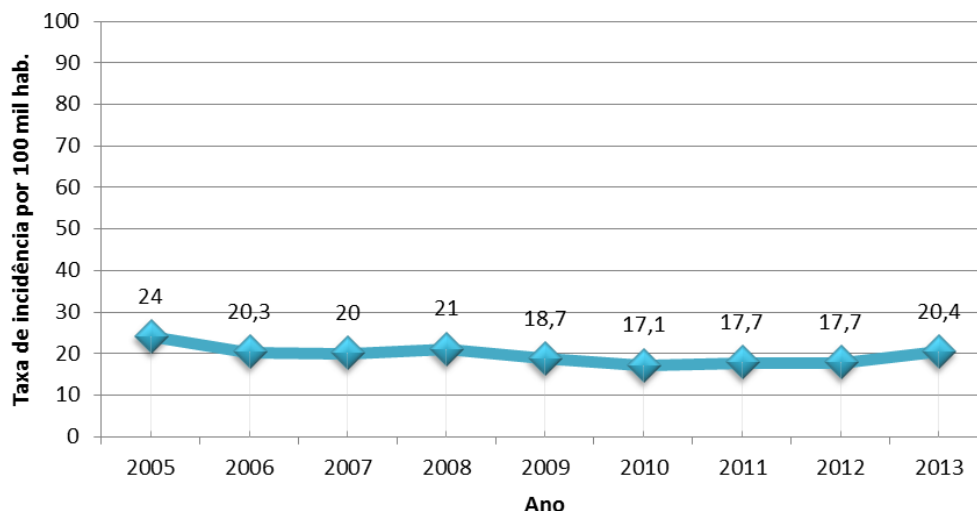


Fig.1: Incidence of leprosy cases reported in Pará, 2005 to 2013.

Incidence rate per 100,000 inhabitants.

Table 1 - Number of cases detected, estimated population living in the state of Pará and detection rate of leprosy patients, by year, 2005 to 2013.

Year	Number cases	of Population	Detection rate % (Per 100,000 inhabitants)
2005	625	2.421	24,0
2006	536	2.427	20,3
2007	478	2.367	20,0
2008	499	2.346	21,0
2009	442	2.400	18,7
2010	404	2.279	17,1
2011	425	2.288	17,7
2012	384	2.242	17,7
2013	458	2.242	20,4
Total	4.251	21.125	19,6

Most cases were observed among men (52.2%) and individuals with brown skin color (68.9%) living in the urban area (72%), with indeterminate form in 1,513 (35.5%) followed by dimorph in 1,282 (30.1%) of the disease, were classified as paucibacillary 2,552 (60%). Most of the cases had a negative smear with 440 (10.3%), with zero degree of physical incapacity in 3,385 (79.5%). In this study, most of the cases investigated did not have nerves compromised by the disease 3,723 (87.5%) and with the appearance of single lesions 1,911 (44.9%).).

Table 2 - Distribution of socio-demographic characteristics and clinics of individuals with leprosy (n=21,125) in Pará, 2005 to 2013.

Variables	n	%
Sex		
Male	2.221	52,2
Female	2.029	47,7
Race/color		
Ignored	99	2,3
White	580	13,6
Black	544	12,7
Yellow	57	1,3
Brown	2.934	68,9
Indigenous	37	0,8
Area of residence		
Ignored	323	7,5
Urban	3.064	72
Rural	844	19,8
Periurban	20	0,4
Clinical form		
Ignored	190	4,4
Undetermined	1.513	35,5
Tuberculoid	893	20,9
Dimorpha	1.282	30,1
Virchowiana	258	6
Unclassified	115	2,7
Classification		
Ignored	3	0,07
Paucibacillary	2.552	60
Multibacillary	1.696	39,8
Degree of physical incapacity		
Ignored	59	1,3
Degree zero	3.385	79,5

Degree I	446	10,4
Degree II	110	2,5
Number of nerves affected		
0 Nerves	3.723	87,5
1 to 3	392	9,2
4 to 6 Nerves	109	2,5
7 to 9 Nerves	24	0,5
10 and more Nerves	3	0,3
Number of cutaneous lesions		
Informed 0 or 99	132	3,1
Single lesions	1.911	44,9
2-5 lesions	1.465	34,4
>5 lesions	743	17,4
Bacilloscopy		
Positive	258	6
Negative	440	10,3
Total	4.251	19,6

IV. DISCUSSION

Brazil is the largest culprit for leprosy endemic in the American continent, being the only country in the Americas where the bill of review is considered endemic (Vieira et al., 2014).

Due to this large number of infected people, leprosy is considered a public health problem in Brazil, and the state of Pará is specifically hyperendemic for this disease, which led this study to be carried out to evaluate the incidence and characteristics of reported cases in the period 2005 to 2013.

Among the results found was a decline in the incidence of leprosy in children under 15 (15%), from 24% of new cases/100,000 in 2005 to 20.4% of new cases/100,000 in 2013.

Studies have shown that in 2011 alone, Brazil had a new case count of 20.56 cases/100,000 inhabitants, and the northern region had the highest incidence among states, with a higher rate than the national one, the state being classified as hyperendemic for leprosy (V. F. M. de Souza, Silva, Valle, Obadia, & Daxbacher, 2011; Vieira et al., 2014).

In relation to the sex of the minors affected, the results showed a small difference between the male sex 52.2% and the female sex 47.7%. Studies of Moura, Fernandes, Bastos, Luna, & Machado, (2013) revealed a higher percentage of cases among females, cases were detected in 61% of female children and 39% in males.

Other studies collaborate with this result by stating that there are no differences according to sex in relation to children, and that these findings show that the

disease is not related to genders, but rather to the risk of exposure to the causative agent (Ferreira & Alvarez, 2005; Imbiriba et al., 2008).

For Arantes, Garcia, Filipe, Nardi, & Paschoal, (2010), the carelessness that men have with their health can also be considered as a risk factor, since men seek little for medical treatment and routine examinations, unlike women, who in addition to the concern with health, perform examinations periodically, in addition to paying more attention to physical and personal appearance.

In relation to race/color, 68.9% of the cases occurred among minors with brown skin, 13.6% among whites and 12.7% in blacks. Study of Santos, Castro, & Falqueto, (2008) identified in its discrete sample a predominance of the brown race 38.9% followed by 37.8% of the black race. These results are in accordance with the 2010 Census data, which found a higher concentration of blacks and browns in the North and Northeast.

Another finding of this study is that the majority of leprosy cases occur in children under 15 years of age living in urban areas and their peripheries (72%). This may be related to the fact that a large part of the population of the State of Pará is still concentrated in these areas, occupying irregularly the spaces, living without housing conditions and physical structure, conditioned by precarious places of basic sanitation, domestic waste collection, also without access to potable water, education and quality information.

A study conducted by Sousa et al., (2013) in the municipality of Ananindeua Pará, revealed that the large number of students diagnosed, came from an area of occupation with or without any sanitary conditions, whose constitution were poorly ventilated residences, small and very close to each other, facilitating the transmissibility of the Hansen's bacillus.

In this perspective, people in unfavorable socioeconomic conditions, with low quality of medical services and residing in places with agglomerations, are possibly individuals at higher risk of acquiring infectious diseases. Still according to the author, this risk is observed in most families that were located in regions of greater social exclusion, who lived in houses with little lighting and ventilation, these factors and conditions being favourable to the spread and transmission of leprosy bacteria (Lopes & Rangel, 2014).

As for clinical aspects, the most reported form was the indeterminate form (35.5%) followed by the dimorph (30.1%), where what was expected would be the indeterminate form followed by the tuberculoid. In the classification of lesions regarding appearance and distribution, the paucibacillary form was the most evident

(60%), with multibacillary being present in 39.8% of cases. Therefore, most of the cases found in Pará between 2005 and 2013 were the indeterminate-paucibacillary and multibacillary dimorph.

According to a study of Sousa et al. (2013), The predominance of the paucibacillary form may indicate that activities for the early diagnosis of new cases are being applied rapidly. The occurrence of clinical forms in this sequence was found in the study of Ferreira e Alvarez (2005), although indeterminate forms of paucibacillary tuberculoid are expected in children.

Vieira et al. (2014) states that MB-shaped individuals have a high spread rate of *Mycobacterium leprae* due to a high load of Hansen's bacilli and can eliminate it in the environment, unlike patients with undetermined forms and tuberculoid.

In a study carried out by Alencar et al. (2008), The clinical form of tuberculoid was the most frequent up to 50% of cases detected in 2006. Unlike the study by Ferreira e Alvarez (2005), who found 56% of patients with the dimorphic form, followed by the undetermined with 30.8% and tuberculoid with 13.2%.

Although the results indicate that the paucibacillary form is the most common incident (60%), the presence of multibacillary case reports in children (39.8%) cannot be considered common, in fact it serves as a warning to local authorities, since multibacillary forms are considered the most contagious and incapacitating. Arantes et al (2010) suggests in its studies that special attention should be given to these children, since multibacillary cases have a 65% chance of developing deformities, especially if changes in neurological functions are identified at the time of diagnosis.

This result suggests neglect of disease control and combat activities in the state of Pará, with regard to the active search for new cases and examinations of its communicators or intradomicile contacts, contributing to the maintenance of the transmission cycle. According to Ferreira e Alvarez (2005), the fact that 62.0% of the cases in its study have intradomicile contacts with leprosy history, is due to the performance of the team of professionals working in the control of the disease in the studied municipality, seeking not only to diagnose the new cases, but also to seek and examine the communicators of these patients, thus preventing the growth of the transmission chain.

As a consequence, permanent sequelae, measured by the degree of physical disability that the disease causes, emerge. In the present work, 79% of the cases were grade 0 and 10.4% grade I, in 7.2% of the cases the physical disability of the patients was ignored or not evaluated.

Imbiriba et al, (2008) states that this is due to the presence of evaluation errors, lack of important records in the medical records and notification forms, or even the absence of qualified professionals in the patients' care units.

Thus, although the proportion of cases of physical disability is not high, it is necessary that this characteristic be recognised as one of the main causes of the stigma process of leprosy in every parent, as the sequelae can damage the lives of these minors with regard to social coexistence and development (Morgado et al., 2017; Santana et al., 2018).

Regarding the number of nerves affected, 87.5% of the cases had no impairment, and only 12.27% had some impairment. The same can be observed in relation to skin lesions, where 44.9% of the individuals had a single lesion, 34.4% with 2 to 5 lesions, and 17.4% with more than 5 lesions. According to a study by Sousa et al, (2013), all data are significant within a studied population, provided that the coefficients used by the National Plan for Control and Elimination of Leprosy, which says about the high endemicity of less than one case /10,000 inhabitants, are considered (Ministério da Saúde Brasil, 2010b).

Therefore, in this study, the state of Pará presented a mean incidence coefficient in children under 15 of 19.6/100,000 inhabitants, according to the data collected, evidencing the need for greater attention from health teams and greater preparation to fight the disease in children.

Ferreira & Alvarez (2005) affirms that it is necessary to decentralize the care of the leprosy carrier, taking the care to more distant regions, training and capacitating new teams of the family health strategy, together with other professionals who work in the municipalities, in order to diagnose and treat these minors early, thus avoiding the growth of the number of cases of the disease in the polarized forms in minors in this age group.

It is believed that the number of leprosy cases in children under 15 is even higher due to under-notification. To Rocha, Lima, Stevens, Gutierrez, & Garcia, (2015), procedures for correcting and updating data in information systems are important as this contributes to the improvement and quality of the information available, especially in cases of leprosy, where the disease is complex and needs follow-up and reliable information.

The author also states that "although discharge is considered at the end of treatment, attention should be broader and incorporate aspects related to disabilities, transmission and occurrence of reactions".

Thus, despite the major public health problems in the state of Pará, this study reveals a drop in the incidence of case numbers of the disease, showing that there has been an advance in the interruption of active transmission circuits, made possible by public health policies aimed at epidemiological control and prevention of new cases.

V. CONCLUSION

The present study showed a reduction in the incidence of leprosy in children under 15 in the state of Pará. Among the characteristics of the cases reported, the most frequent were: most of the cases in males, in grizzly individuals, living in the urban area, with the clinical forms undetermined and dimorphic, classified as paucibacillary, without physical disabilities (grade zero) and with predominance of single lesions and without nerves compromised by the disease.

Therefore, it is necessary to decentralize care to the bearer of the disease by implementing prevention activities (primary, secondary and tertiary) and control, training of family health strategy teams and more efficient coverage of health services.

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