

## Oral health conditions in leprosy cases in hyperendemic area of the Brazilian Amazon

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### ABSTRACT

Leprosy is a hyperendemic chronic condition in the *Rondônia State*. Despite the significant impact of oral health on the quality of life and clinical evolution of leprosy patients, systematic evaluation of oral health status has been neglected. To analyze the dental-clinical profile, self-perceived oral health and dental health service access of leprosy cases in the municipality of Cacoal in *Rondônia State*, North Brazil, from 2001 to 2012. A descriptive, cross-sectional study design was performed based on dental evaluation and standardized structured instruments. We investigated clinically assessed and self-perceived oral health status, as well as dental health service access. A total of 303 leprosy cases were included; 41.6% rated their oral health as good, and 42.6% reported being satisfied with their oral health. Self-reported loss of upper teeth was 45.5%. The clinical evaluation revealed that 54.5% had active caries. Most (97.7%) cases reported having been to the dentist at least once in their life and 23.1% used public health services. The poor standard of oral health in this population may increase the risk for leprosy reactions, consequently reducing quality of life. Low access to public health dental services and poor self-perceived oral health reinforce the need to achieve comprehensive health care in this population.

**KEYWORDS:** Leprosy. Oral Health. Self-image. Health profile. Health service accessibility

### INTRODUCTION

Given the diversity of its clinical, dermatological and neurological symptoms and its slow evolution, leprosy may lead to disabilities and physical deformities, particularly in cases of delayed diagnosis and/or inappropriate treatment<sup>1,2</sup>. Leprosy is a chronic infectious condition with significant physical, psychological, social and behavioral impacts on both patients and their families. The neglected nature of the disease is exacerbated by prejudice and stigma, factors that are detrimental to its control in endemic countries<sup>3,4</sup>.

One of the most critically undervalued issues within the comprehensive care plan for leprosy is oral health<sup>5,6</sup>. In addition to the possibility of oral lesions secondary to the disease, poor oral health status represents a potential risk factor for propagated disease transmission, and above all, the occurrence of leprosy reactional episodes<sup>7</sup>.

The diagnosis and appropriate treatment of oral health conditions, especially those associated with or facilitating infections, might help reduce the incidence of leprosy reactions and facilitate their management upon occurrence<sup>6-8</sup>. Consequently, the quality of life of these individuals can also be improved, allowing them to better cope with the stigma attached to this disease. Continuous preventive and restorative

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dental treatments should be provided, even after discharge, in cases of persisting risk that an oral health condition could trigger leprosy reactions<sup>6-9</sup>.

Given the possibility of a relationship between oral health and leprosy evolution, a systematic evaluation of oral status is currently recommended by the Ministry of Health<sup>9</sup> as a component of routine health care services. However, this approach has been neglected by the Brazilian National Health Service (Unified Health System - SUS), and only a few studies have comprehensively addressed the oral health status, self-perception of oral health or access to dental services<sup>6</sup>. Given the presence of highly endemic areas in the country, such as in the North region, this scenario reflects the relevance of leprosy and oral health as public health problems.

The aim of this study was to describe the clinical and dental profile of, self-perception of oral health, and access to dental care of leprosy patients from Cacoal, *Rondônia State*, Brazil, from 2001 to 2012.

## MATERIAL AND METHODS

### Study Design

A descriptive, cross-sectional study was conducted in the city of Cacoal, *Rondônia State*. The municipality is located approximately 480 km from the state capital, Porto Velho, and has an area of 3,793 km<sup>2</sup> (accounting for 1.6% of *Rondônia State* and 0.10% of the Amazon region). The population of Cacoal was estimated at 86,556 inhabitants in 2015 (population density of 20.72 inhabitants/km<sup>2</sup>). Cacoal is the fourth largest municipality in the *Rondônia State*, reflecting its importance in the Amazon region. In 2010, the municipality had a Human Development Index of 0.718, the third highest in the state, and was ranked 1,362<sup>nd</sup> among the country's 5,565 municipalities. However, a history of intra- and inter-municipal inequality persists, with a poverty rate of 28.75% and Gini Index (used to measure the degree of income - social inequality concentration) of 0.46 (Brazil, 0.56).

### Study Population

The study population consisted of leprosy patients living in the municipality of Cacoal and reported to the Information System for Notifiable Diseases (SINAN) during 2001-2012. This study was conducted between April and October 2014, and all leprosy patients were receiving post-multidrug therapy (MDT).

Exclusion criteria included the following: change of domicile outside the city under study, death, not granting

consent for the completion of the dental evaluation, refusal to participate in the study as a whole and failure to attend scheduled evaluations.

### Data Collection

The study population was identified based on data from the SINAN leprosy database, which is under the purview of the Municipal Department of Health, Epidemiological Surveillance of Cacoal. The following sources were consulted to validate the data obtained from the SINAN: the Primary Care Information System (SIAB), the National Register of Unified Health System Users (CADSUS) and the "Bolsa Família" program (Conditioned Cash Transfer program). These data sources were reviewed to update the address and telephone information for notified patients, thereby enabling participants were contacted at home and evaluations scheduled.

Data collection was carried out within the catchment areas of the basic family health units (population coverage in 2015 of 78.3%) and support venues, such as city schools.

The overall assessment of oral health status, and the clinical impact of oral health was conducted by utilizing a questionnaire adapted from that of the "Oral Health Conditions of the Brazilian Population Project". Questions on self-perceived oral health and access to dental health services and clinically assessed oral health status (caries, periodontal disease, need for treatment, use and need of prosthesis and soft-tissue changes) were also included.

In addition to the performance of the clinical examination, sociodemographic and epidemiological data relevant to leprosy were collected. All the patients included in the study had dental clinical evaluation performed by trained professionals, following the protocol and parameters used in the National Oral Health SB-Brazil<sup>11</sup>.

### Data analysis

Data were analyzed descriptively, with variables expressed as absolute and relative frequencies. The organization and analysis of data was performed using Epi-Info version 7.1.5 (Centers for Disease Control and Prevention, Atlanta, GA, USA) and Stata version 11.2 (Stata Corp LP, College Station, TX, USA).

## ETHICAL ASPECTS

This study was approved by the ethical review board of the *Federal University of Ceará* on February 28, 2014 (Process N° 554.962).

## RESULTS

The oral health of a total of 303 leprosy patients from the municipality of Cacoal city was assessed during the study period. There was a predominance of women in the included patients (173 [57.3%]), and participant age ranged from 15 to 60 years, with mean of 42 years. Regarding education, 12.4% were illiterate, 24.4% had a primary education, 54.1% had a high school education and 9.1% had a higher level of education. Additionally, 50.5% were actively working, 46.7% were not actively working and 1.8% had never worked.

One hundred and sixty-two cases met the operational classification for multibacillary leprosy (53.4%); disability grades 1 and 2 disability were identified in 118 (38.8%) cases, and the occurrence of leprosy reactions during the disease course was observed in 97 (32.0%) patients. At the time of the present study, 16 patients (16.4% of reactive patients) were undergoing treatment for leprosy reactions. Among the reactive cases, 16.5% had leprosy type 1 (reversal) reactions and/or neuritis and 23.9% had erythema nodosum leprosum and/or neuritis.

Table 1 shows the self-rating of and perception data for oral health within the study population. Although most leprosy patients rated their oral health as good (41.6%) and reported being satisfied with their oral health status (42.6%), the prevalence of tooth loss was high in this group, as evidenced by the use of or need for prostheses. Loss of teeth in the upper dental arch was notable, but significant tooth loss was also identified in the lower arch. The poor oral health condition of these patients was further reinforced by the identification of a need for dental treatment in 69.6% of the cases and the presence of pain in 20.1% of patients during the six months preceding the interview.

Table 2 shows data on access to and usage of dental services by the participants. The vast majority of patients reported having seen the dentist at least once in their life (97.7%), and most had visited the dentist within the last year (39.3%). Notably, 87 (28.7%) reported not having been to the dentist for three years or longer. However, a private dental service was the most frequently used (71.3%). Most participants did not disclose to their dentist that they had leprosy (64.4%), and when they did, participants reported that this disclosure did not influence the conduct or behavior of the dentist.

As shown in Table 3, the clinical evaluation of oral health revealed that a high proportion of patients had dental caries; these caries were identified in the crown (43.9%), root (12.9%) and total tooth (45.5%). Notably, a significant proportion of patients used prostheses (46.2% upper and 23.4% lower), had edentulous (22.8%) and

**Table 1** - Self-rating and perception of oral health status in the leprosy cases at post-discharge (n = 303) in Cacoal, Rondonia State, Brazil, 2001-2012

CHARACTERISTICS	CASES	
	n	%
<b>Self-rating of health oral</b>		
Good	126	41.6
Satisfactory	108	35.6
Poor	50	16.5
Very poor	11	3.6
Very good	7	2.3
Did not know/answer	1	0.3
<b>Satisfaction- Oral health</b>		
Satisfied	129	42.6
Dissatisfied	92	30.4
Neither satisfied nor dissatisfied	63	20.8
Very satisfied	9	3.0
Very dissatisfied	6	2.0
Did not know/answer	4	1.3
<b>Use of total prosthesis</b>		
Change required	146	48.2
No	119	39.3
Yes	37	12.2
Not applicable	1	0.3
Did not know/answer	0	0.0
<b>Tooth loss</b>		
<i>Upper</i>		
Yes, all teeth	138	45.5
Yes, from 1 to 5 teeth	87	28.7
No	38	12.5
Yes, 6 teeth or more	37	12.2
Did not know/answer	3	1.0
<i>Lower</i>		
Yes, from 1 to 5 teeth	121	39.9
Yes, 6 teeth or more	76	25.1
Yes, all teeth	70	23.1
No	32	10.6
Did not know/answer	4	1.3
<b>Use of prosthesis</b>		
No	123	40.6
Total upper prosthesis	74	24.4
Total upper/lower prostheses	51	16.8
Prosthesis for >1 tooth	46	15.2
Prosthesis for 1 tooth	4	1.3
Total lower prosthesis	3	1.0
Did not know/answer	2	0.7
<b>Dental treatment required</b>		
Yes	211	69.6
No	87	28.7
Did not know/answer	5	1.7
<b>Tooth pain in last 6 months</b>		
No	206	68.0
Yes	61	20.1
Not applicable	35	11.6
Did not know/answer	1	0.3

**Table 2** - Access to dental services in the leprosy cases at post-discharge (n = 303) in Cacoal, *Rondônia State*, Brazil, 2001-2012

CHARACTERISTICS	CASES	
	N	%
<b>Visit to dentist</b>		
Yes	296	97.7
No	4	1.3
Did not know/answer	3	1.0
<b>Time since last visit to dentist</b>		
Less than 1 year	119	39.3
≥ 3 years	87	28.7
1 year - < 2 years	56	18.5
2 years - < 3 years	34	11.2
Never/Not applicable	4	1.3
Did not know/answer	3	1.0
<b>Consultation setting</b>		
Private service	216	71.3
Public service	70	23.1
Health plan/medical insurance	7	2.3
Other	5	1.7
Not applicable	4	1.3
Did not know/answer	1	0.3
<b>Changes in conduct of dentist after diagnosis</b>		
Not disclosed- not applicable	195	64.4
Disclosed - no changes	84	27.7
Disclosed – yes, positively	16	5.3
Did not know/answer	7	2.3
Disclosed - yes, negatively	1	0.3

exhibited changes in soft-tissues (12.5%), gums (6.3%) and the palate (5.6%).

As depicted in [Figures 1](#) and [2](#) lesions not associated with active leprosy, including dental caries, the absence of dental elements, residual roots, gingivitis, presence of biofilm, dirty tongue, and brushing deficiency, were identified in study subjects. All photos were obtained with the permission of study participants.

## DISCUSSION

This study reiterates the nature of the individual, programmatic and social vulnerabilities experienced by people with leprosy through conducting a descriptive analysis of oral health in a hyperendemic area of the Brazilian Amazon<sup>1-3</sup>. The present study is highly representative of the Amazonian population and the first of its kind to be conducted in this demographic and epidemiological context. Unsatisfactory clinical standards and perceptions of oral health, together with poor access to the public health system, highlight the association between poor oral health and the risk of leprosy reactions

**Table 3** - Oral health status in the leprosy cases at post-discharge (n = 303) in Cacoal, *Rondônia State*, Brazil, 2001-2012

CHARACTERISTICS	CASES	
	n	%
<b>Tooth cavity– Crown</b>		
Yes	133	43.9
No	170	56.1
<b>Tooth cavity– Root</b>		
Yes	39	12.9
No	264	87.1
<b>Teeth cavities – Total</b>		
Yes	138	45.5
No	165	54.5
<b>Use of upper prosthesis</b>		
Yes	140	46.2
No	163	53.8
<b>Use of lower prosthesis</b>		
Yes	71	23.4
No	232	76.6
<b>Edentulism (upper and lower arches)</b>		
Yes	69	22.8
No	234	77.2
<b>Changes in soft tissues</b>		
Yes	38	12.5
No	265	87.5
<b>Changes in gums</b>		
Yes	19	6.3
No	284	93.7
<b>Changes in palate</b>		
Yes	17	5.6
No	286	94.4

occurrence, which, in turn, may cause serious nerve damage<sup>10,11</sup>. This risk exists in this population of the Brazilian Amazon.

Because self-perception is a subjective indicator, it should not be used alone to diagnose dental or oral status, but rather in combination with systematic clinical evaluations. This approach can help inform public policy programs targeting this population, thereby facilitating more effective access to dental services<sup>12,13</sup>. Multidisciplinary and interdisciplinary teams that include oral health professionals with a knowledge of leprosy should collaborate, thereby enabling complications of the disease to be identified and controlled. In addition, this approach may help reduce the intensity and frequency of leprosy reactional episodes<sup>8-14</sup>.

In contrast with our results, the findings of a previous study<sup>15</sup> showed that 25.8% of leprosy patients had visited a dentist within the past year. It should be noted that the previous study and our study differed in terms of duration of data collection: in our study, data were collected during



**Figure 1** - Clinical conditions of oral health in a leprosy case: A) poor brushing, gingivitis, caries; B) and C) alteration in unidentified jugal tongue and mucosa; D) erosion



**Figure 2** - Clinical conditions of oral health in a leprosy case : periodontitis, absence of dental elements, dental caries

a post-discharge period of up to 10 years, while in the study conducted by Souza *et al.*<sup>15</sup> cases of active disease were evaluated. In addition, other studies have shown that dissatisfaction with oral health negatively impacts both social and emotional relationships within this population, potentially leading to increase usage of health services<sup>16</sup>.

Tooth loss can be interpreted as a failure in attempts to perform restorative work or to practice daily oral hygiene<sup>17</sup>. Tooth loss may also represent a factor detrimental to the health of these subjects by limiting food selection and contributing the other impacts of the disease.

Of the patients evaluated, more than half had active carious lesions. This finding differed from those reported by other authors, who observed an average of 6.49% decayed teeth per patient with active disease<sup>18</sup>. This points to the need for the development of programs based on timely treatment and health promotion and prevention and aimed at modifying dental hygiene habits in this community<sup>19</sup>.

The oral lesions identified in this study population were not those most recognized in the literature to be associated with active leprosy. The study population profile, with different durations post-MDT discharge, may have

influenced these findings. It is noteworthy, however, that no pathognomonic oral lesions were identified in the leprosy patients, but rather a broad spectrum of non-specific injuries was observed in the oral cavity in association with the disease, injuries that may progress with age<sup>20</sup>. Additionally, *M. leprae* can be detected in the oral mucosa of patients both with and without clinical symptoms of disease using laboratory methods<sup>21</sup>, including anatomopathological exams<sup>22</sup> and polymerase chain reactions (PCRs)<sup>23-25</sup>. Moreover, despite the fact that leprosy-specific symptoms in the oral mucosa are rare in recent or paucibacillary cases under active treatment<sup>22</sup>, this is the only type of lesion that may lead<sup>25</sup> to diagnosis of disease. Examination of the oral mucosa should, therefore, be an integral part of the clinical examination of leprosy patients because these lesions, along with nasal lesions, can be a source resulting in bacillus transmission in the community<sup>26</sup>.

Thus, given the contribution of these lesions to the persistence or worsening of the leprosy reactions<sup>27,28</sup> and whose episodes can cause motor deficits<sup>5</sup>, dentists must recognize leprosy and the importance of treating infectious diseases of the oral cavity. The seeking of oral health care should be encouraged among people with leprosy so that dental infections can be detected and treated early<sup>29,30</sup>. This study corroborates the results of previous studies<sup>23</sup> showing that people affected by leprosy, as well as a contingent of the general Brazilian population, are affected by poor oral health<sup>15</sup>.

When asked about which type of dental service was sought, approximately 71% of patients reported having used private services. These results corroborate the findings of a previous study examining active cases<sup>15</sup>, in which nearly half of the study population used private services due to their increased availability and access. A low proportion of lower prosthesis use was identified (23% of edentulous); this rate was likely due to a lack of prosthesis stability, which can hamper chewing and speaking and eventually lead to its abandonment<sup>13</sup>. In another study<sup>12</sup>, a possible lack of secondary dental care services was suggested. The high use of dental services by leprosy patients from Cacoal indicate that these individuals care about their oral health. However, there is a need for special care in this population<sup>31,32</sup>.

This study has some limitations related to the use of the SINAN database. These limitations may explain the inclusion of only 35% of potentially eligible cases due to inaccurate addresses, survival bias or migration. The approach utilized for ascertainment of case eligibility was performed in a standardized manner, representing a highly representative sample of the population with leprosy in the municipality of Cacoal. Despite its limitations, this important study is the first of its kind to be conducted in the

*Rondônia State* and reinforces the need for comprehensive healthcare for leprosy patients following Pos MDT discharge. Further studies addressing the relationship between clinical settings and oral health vulnerability in individuals with leprosy<sup>33</sup>, both in active treatment and post-discharge, should be carried out to further facilitate the achievement of comprehensive care.

We conclude that the poor standards of oral health in populations experiencing high social vulnerability due to leprosy may increase the risk nerve damage progression from leprosy reactional episodes.

We, therefore, emphasize the need to achieve the provision of comprehensive health care to this underserved population through the incorporation of oral health not only in primary care but also within a referral network with greater technological resources. This action may increase the potential of oral rehabilitation in these individuals, thereby reducing stigma and prejudice and enhancing quality of life.

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