



The Open Nursing Journal

Content list available at: <https://opennursingjournal.com>



RESEARCH ARTICLE

Physical Disabilities and Individual Vulnerability: Perspectives in Hyperendemic Municipalities for Leprosy

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Abstract:

Introduction:

Epidemiological, operational and socio-demographic data on leprosy, as well as its direct and indirect impact on the affected person, his/her family, and community, are included in the group of neglected diseases.

Objective:

To analyze the association between the occurrence of physical disabilities in leprosy cases and individual vulnerability in hyperendemic municipalities.

Methodology:

population-based cross-sectional study of leprosy cases reported from 2001 to 2014 in two municipalities of Piauí/Brazil. Interviews and descriptive, bivariate and multivariate analyses were conducted to study eventual associations.

Results:

Of the 603 cases evaluated, the most frequent were female (52%), brown (46%), with low schooling, married/united (50%) and retired (28%). A significant proportion of cases was multibacillary (46%), Virchowian clinical form (14%), reactional episodes (20%), disability degree I or II (70%). The explanatory variables for the presence of some degree of physical disability were gender, age group, perceived health, operational classification, clinical form, and hypertension ($p < 0.05$).

Conclusion:

The physical disabilities caused by leprosy involve, in addition to dermatoneurological damage, psychological damage resulting from the strong stigma they produce. This result reinforces the need for differentiated care and nursing in disability prevention, physical rehabilitation and psychological follow-up to ensure comprehensive care.

Keywords: Leprosy, Vulnerability, Inability, Prevention, Brazil, Health.

Article History

Received: November 7, 2020

Revised: February 11, 2021

Accepted: March 2, 2021

1. INTRODUCTION

The magnitude of leprosy in Brazil is sustained at high endemic levels [1]. The state of Piauí registered, from 2001 to 2014, 20,467 cases of leprosy, and the municipalities of Floriano and Picos reported, respectively, 1,076 and 689 confirmed cases. What stands out is that, in 2014, the general

leprosy detection coefficients indicated the State of Piauí as endemic for the disease (33.74/100,000 inhabitants) and Floriano (85.18/100,000 inhabitants) and Picos (48.49/100,000 inhabitants) as hyperendemic [2 - 7].

Epidemiological, operational and socio-demographic data of leprosy, as well as its direct and indirect impact on the affected person, his/her family, and community insert it into the group of neglected diseases. Its presence occurs in a

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context of poverty-promoting conditions still persistent, indicating different intensities of vulnerability, not only economic but also individual, programmatic and social. Therefore, vulnerability indicates the aspects that are potential for illness or not [8, 9].

The analysis of individual vulnerability considers the behaviors that facilitate the occurrence of injuries and infections. It consists of issues inherent to the individual, such as comorbidities, gender, age, perceived social support. Thus, personal and environmental factors may interfere in the physical disability and functionality of the person affected by leprosy [10, 11].

Given its ability to produce physical disabilities and stigmas in affected people, leprosy has high complexity in its expression and control. The injuries generated by the disease can result in physical disabilities, limitation of activities, and impairment of social participation in the affected person, besides causing decreased work capacity, stigmas, social and psychological damage to the individual during the treatment of the disease and after cure [1, 11, 12].

Thus, this study is justified by the growing need to undertake innovative and effective control actions. It should necessarily involve the search for new strategies to approach health professionals and managers to the problem that consists of the disease, especially regarding individual vulnerability and its relationship with the physical disabilities produced by the disease. This study aimed to analyze the association between the occurrence of physical disabilities and individual vulnerability of leprosy cases living in two hyperendemic municipalities.

2. METHODOLOGY

This is a cross-sectional population-based study inserted in operational multicentric research, entitled: IntegraHans Piauí: integrated approach to clinical, epidemiological (space-time), operational and psychosocial aspects of leprosy in municipalities of high endemicity in Piauí.

The study was developed in two municipalities of Piauí, with the first located 244 km from the capital, Teresina, with an estimated population for 2016 of 58,892 inhabitants. The second, located 307 km from the capital, had a population of 76,749 people for 2016 [13]. Both were selected because they are hyperendemic for leprosy and important economic centers of the state, in addition to meeting the criteria of the Ministry of Health among the 253 Brazilian municipalities priority for leprosy surveillance, within the Integrated Plan of Strategic Actions 2011-2015 [6].

The population basis of the study was composed of the universe of leprosy cases living in Floriano and Picos, reported at the Notifiable Diseases Information System (SINAN) made available by the State Health Bureau of Piauí, from 2001 to 2014 (from the year leprosy integrated SINAN until the last year with completed cases and available before the beginning of data collection). During this period, the municipality of Floriano and Picos reported 1,765 cases.

As this is a census study, it sought to approach the entire basic population; however, 748 cases were found, of which 603

were evaluated and participated in the study. The others (145) could not participate for several reasons: work limitation, hospitalization, travel, and refusal. It is noteworthy that, of the 1,017 cases not located, 90 evolved to death, information later confirmed through the Mortality Information System (SIM), 129 had changed addresses, and 798 cases had incomplete or non-existent address at SINAN.

The following variables were analyzed: gender, age, schooling, marital status, work context and average monthly income. For clinical characterization, the following variables were considered: operational classification (paucibacillary and multibacillary); clinical form (indeterminate, tuberculoid, borderline, Virchowian, and unclassified); reactional episode; and eye-hand-foot score (EHF), which ranges from 0 to 12, and the farther from zero, the greater the damage caused [11].

An individual vulnerability was analyzed based on the personal and clinical characteristics of leprosy cases, such as: gender; age group, individual income, education, social support, presence of comorbidities in 2016; operational classification, clinical form, and reactional episodes.

The outcome variable was the presence of any degree of Physical Disability (DPD) after discharge, i.e., DPD 0 was considered as the absence of disability and DPD I and II as presence [12].

It should be noted that EHF and DPD measurements are instruments and scores already used by the Ministry of Health of Brazil.

Data collection occurred only in 2016, after the researchers' qualification on all aspects involving leprosy (clinical form, operational classification, disabilities, exams, treatment, leprosy reaction, among others). Physical examinations occurred on the same day of the questionnaire application and in reserved rooms with adequate lighting for evaluation, preserving the individual's privacy.

The instruments used for the collection were: simplified neurological evaluation (standardized by the Ministry of Health) and research instrument for the clinical-epidemiological survey. Additional data to the operational classification and clinical form were obtained from SINAN. The typing was performed in EpiInfo® software version 7.0 and analyzed using STATA® Software version 13.0. Soon after the search and correction of inconsistencies, descriptive statistical analyses of frequency and measures of central tendency were performed to explore each variable separately.

In the group of categorical variables, the chi-square test and Fisher's Exact Test were used. Variables with a p-value ≤ 0.20 in the bivariate analysis were inserted in a multivariate logistic regression model [14], analyzing the adjusted Odds Ratio measurement. For all analyses, the significance level of $p \leq 0.05$ was maintained for rejection of the null hypothesis. The confidence level was set at 95%.

This research was approved by the Research Ethics Committee (REC) of the Federal University of Piauí (Opinion no. 1.115.818), according to Resolution no. 466/2012 of the National Health Council [15]. The Free and Informed Consent Term and the Term of Consent for minors under 18 years old were applied.

3. RESULTS

Of the 603 study participants, the majority consisted of women (52.07%). They were between 10 and 102 years old, with an average of 51.64 years. Only 3.98% had completed higher education, while 44.61% had an only incomplete elementary school and 23.05% had no schooling. The marital status of the most frequent participants was married/united

(49.75%). The average individual monthly income corresponded to 282.72 US\$. The majority had a paucibacillary operational classification (53.57%) and indeterminate clinical form (35.82%), followed by borderline (28.19%), and tuberculoid (16.25%). Reactional episodes were observed in 20.23% of the cases. A higher proportion of cases with DPD I (54.39%) and mean EHF score of 2.03, ranging from 0 to 12 (Table 1).

Table 1. Characterization of the surveyed population. PIAUÍ/BRAZIL – 2016. (N=603).

Variables	n (%)	\bar{x}	SD	95% CI	Min-Max
Gender	-	-	-	-	-
Female	314 (52.07)	-	-	-	-
Male	289 (47.93)	-	-	-	-
Age	-	51.64	18.44	50.15;53.13	10-102
Schooling (years)	-	6.05	5.20	5.62;6.47	0-28
No schooling	139 (23.05)	-	-	-	-
Incomplete Elem. Ed.	269 (44.61)	-	-	-	-
Complete Elem. Ed.	36 (5.97)	-	-	-	-
Incomplete Secon. Ed.	44 (7.30)	-	-	-	-
Complete Secon. Ed.	91 (15.09)	-	-	-	-
Complete Higher Ed.	24 (3.98)	-	-	-	-
Marital Situation	-	-	-	-	-
Married/ united	300 (49.75)	-	-	-	-
Unmarried	165 (27.37)	-	-	-	-
Separated/ divorced	127 (21.06)	-	-	-	-
Unanswered	11 (1.82)	-	-	-	-
Work context	-	-	-	-	-
Retired	168 (27.86)	-	-	-	-
Inactive	04 (0.66)	-	-	-	-
Formal work	106 (17.58)	-	-	-	-
Informal work	119 (19.73)	-	-	-	-
No occupation	113 (18.74)	-	-	-	-
Housewife	56 (9.29)	-	-	-	-
Other	37 (6.14)	-	-	-	-
Individual mean income	-	887.47	761.25	823.71;951.24	0-6000
Operational classification	-	-	-	-	-
Paucibacillary	323 (53.57)	-	-	-	-
Multibacillary	280 (46.43)	-	-	-	-
Clinical form	-	-	-	-	-
Indeterminate	216 (35.82)	-	-	-	-
Borderline	170 (28.19)	-	-	-	-
Tuberculoid	98 (16.25)	-	-	-	-
Virchowian	83 (13.76)	-	-	-	-
Unclassified	36 (5.97)	-	-	-	-
Reactional episodes	-	-	-	-	-
No	428 (70.98)	-	-	-	-
Yes (1/ 2/ 1 and 2)	122 (20.23)	-	-	-	-
Uninformed	53 (8.79)	-	-	-	-
Degree of Physical Disability	-	-	-	-	-
0	178 (29.52)	-	-	-	-
1	328 (54.39)	-	-	-	-
2	97 (16.09)	-	-	-	-
EHF Score	-	2.03	2.16	2.68;3.08	0-12

Note: \bar{x} = mean, \pm = Standard deviation, 95%CI= confidence interval, Min - Max= Minimum and Maximum.

The variables gender, age group, schooling and perceived health after leprosy, operational classification, clinical form and presence of hypertension (Table 2).

In the multivariate analysis, the following variables

remained statistically associated with the presence of DPD I and II: gender, specifically male; age group over 15 years; hypertension, multibacillary operational classification and clinical forms (Virchowian and Borderline); perceived health: very bad and bad, according to Table 3.

Table 2. Characteristics related to individual vulnerability according to the presence of physical disability. PIAUÍ/BRAZIL–2016. (N=603).

Characteristics related to individual vulnerability	Absence	Presence (DPD I or II)	p value
	n (%)	n (%)	
Gender	-	-	0.002
Male	68 (23.53)	221 (76.47)	-
Female	110 (35.03)	204 (64.97)	-
Age group in years	-	-	0.012
< 15	4 (50.00)	4 (50.00)	-
≥ 15	174 (29.24)	421 (70.76)	-
Schooling	-	-	0.001
No schooling	23 (16.55)	116 (83.45)	-
Incomplete Elem. Ed.	67 (24.91)	202 (75.09)	-
Complete Elem. Ed.	12 (33.33)	24 (66.67)	-
Incomplete Secon. Ed.	16 (36.36)	28 (63.64)	-
Complete Secon. Ed.	45 (49.45)	46 (50.55)	-
Complete Higher Ed.	15 (62.50)	09 (37.50)	-
Support groups			0.090
No	177 (30.46)	404 (69.54)	-
Yes	01 (4.55)	21 (95.45)	-
Perceived health after leprosy	-	-	0.001
Very bad	2 (8.33)	22 (91.67)	-
Bad	12 (17.39)	57 (82.61)	-
Regular	39 (26.53)	108 (73.47)	-
Good	107 (33.44)	213 (66.56)	-
Very good	18 (41.86)	25 (58.14)	-
Operational classification	-	-	0.001
Paucibacillary	128 (39.63)	195 (60.37)	-
Multibacillary	50 (17.86)	230 (82.14)	-
Clinical form	-	-	0.001
Indeterminate	89 (41.20)	127 (58.80)	-
Borderline	36 (36.73)	62 (63.27)	-
Tuberculoid	35 (20.59)	135 (79.41)	-
Virchowian	11 (13.25)	72 (86.75)	-
Unclassified	07 (46.67)	08 (53.33)	-
Reactional episodes (n=550*)	-	-	0.437
No	127 (26.67)	301 (70.33)	-
Yes	32 (26.23)	90 (73.77)	-
Diabetes	-	-	0.140
No	162 (30.74)	365 (69.26)	-
Yes	16 (21.05)	60 (78.95)	-
Hypertension	-	-	0.010
No	149 (32.82)	305 (67.18)	-
Yes	29 (19.46)	120 (80.54)	-
Dyslipidemia	-	-	0.160
No	152 (31.67)	328 (68.33)	-
Yes	26 (21.14)	97 (78.86)	-

Note: The p-value was obtained by the chi-square and Fisher's exact test. *Excluded from the bivariate analysis, those who could not inform whether they had reactional episodes and without records.

Table 3. Odds Ratio adjusted for the presence of the physical disability. PIAUÍ/BRAZIL – 2016. (N=603).

Independent variables	Presence of PD		
	OR (adjusted)	p value	95%CI
Gender	-	-	-
Male	0.58	0.003	0.41-0.83
Female (*)	-		
Age group in years	-	-	-
< 15	4.30	0.021	1.24-14.87
≥ 15 (*)	-		
Schooling	-	-	-
Up to complete Elementary Education	0.99	0.56	0.98-1.13
Secondary to Higher Education (*)	-	-	-
Individual income	-	-	-
Up to 01 minimum wage	0.79	0.80	0.55-1.12
Over 01 minimum wage (*)	-		
Hypertension	-	-	-
Yes	1.94	0.004	1.23-3.05
No (*)	-		
Diabetes	-	-	-
Yes	1.50	0.172	0.85-2.71
No (*)	-		
Dyslipidemia	-	-	-
Yes	1.33	0.241	0.82-2.17
No (*)			
Operational classification	-	-	-
Multibacillary	2.95	0.001	2.02-4.29
Paucibacillary (*)	-		
Clinical form (n=594)	-	-	-
Virchowian	4.59	0.001	2.30-9.14
Borderline	2.70	0.001	1.71-4.28
Undefined	2.45	0.063	0.95-6.32
Tuberculoid	1.21	0.454	0.74-1.97
Indeterminate (*)	-	-	-
Perceived health after leprosy	-	-	-
Very bad	15.84	0.010	1.95-128.50
Bad	3.42	0.006	1.43-8.15
Regular	1.96	0.068	0.95-4.05
Good	1.43	0.277	0.75-2.74
Very good (*)	-	-	-
Support groups	-	-	-
No	6.04	0.083	0.78-46.30
Yes (*)	-		

Note: OR = Odds Ratio adjusted, 95%CI = 95% Confidence Interval. (*) = reference category. The p value was obtained by logistic regression.

4. DISCUSSION

The present study reinforces the epidemiological relevance of leprosy in the state of Piauí, expanding the view to the dimension of individual vulnerability. In addition to hyperendemicity in the studied municipalities, the focus on the analysis of PD and their explanation from sociodemographic and clinical variables reinforces the character of a neglected disease. This is a strategic study considering the fragility of evidence for the state.

The sociodemographic data of the surveyed population are similar to those found in two other studies conducted in cities

endemic for leprosy, Montes Claros - MG and Campos dos Goytacazes - RJ, whose reported cases had schooling compatible with incomplete elementary school, followed by those that with no schooling. The level of education can influence the care of disease prevention and treatment adherence, thus being more exposed to its complications [16 - 18].

The research identified a result similar to a study developed in the extreme south of Santa Catarina, with most female cases. One of the plausible hypotheses is that with the greater concern with aesthetics and greater access to Primary-

Care programs, women have more opportunities to access the diagnosis of various diseases, such as leprosy than the male population [18].

Being male was statistically significantly associated with the presence of PD, disagreeing with a study conducted in Campo Grande-MS, an area with a high leprosy detection coefficient. It is inferred that the male population is less likely to self-care, in view of being in greater social contact, more exposed to risk environments, as they suffer from late diagnosis. On the other hand, women generally have a higher perspective of self-care and the search for health services [18 - 20].

The individual income of the surveyed participants, as well as the mean age, was similar to that identified in studies conducted in Campos dos Goytacazes (Brazil) and the Province of Pinar Del Río (Cuba) [21]. The present study found that the age group of over 15 years presented a significant association for a degree I or II of PD.

Analyzing the average age of people affected by leprosy and the association of the age group over 15 years with a physical disability, it can be inferred that this population is in an economically active phase, and, consequently, there is impairment of individual income. Dermatoneurological lesions in leprosy cases interfere: in the exercise of their daily activities; socioeconomic and psychosocial conditions, in addition to requiring specific care during treatment [17].

A study conducted in Southeastern Africa showed that poverty conditions, lack of stimulus for productivity and low economic growth in some areas might be related to the significant presence of leprosy. In low- or middle-income countries, 30 to 40% of the population reside in precarious housing, exposed to the risk for other diseases besides leprosy. Thus, it is evident the need for actions focused on poverty reduction combined with the performance of socio-educational activities that address topics related to transmission, clinical manifestations, and treatment of the disease, as well as preventive measures for possible complications [22 - 24].

The highest number of cases in the indeterminate form was consistent with the highest percentage in the paucibacillary operational classification [25]. This result differs from that evidenced in a study conducted in Fortaleza-CE, in which the indeterminate form was the least present [26].

The present study pointed out that patients classified operationally as multibacillary and with Virchowian and borderline clinical forms have high chances of developing PD or progressing to more severe conditions, in agreement with what was verified in other studies. Such factors are clinical characteristics of the disease in the reference case of leprosy, belonging here to individual vulnerability. Furthermore, despite the measures taken by the World Health Organization for cure, many still present serious physical disabilities after cure, estimated in approximately 20% of the cases treated in recent decades, with multibacillary classification [27, 28].

The higher frequency of paucibacillary operational classification and EHF score with amplitude from 0 to 12, identified in this study, were similar to those observed in a study developed in the municipality of Araguaína-TO

hyperendemic for leprosy [29]. It was also verified that the value of the mean EHF score was close to that identified in the study developed in Campina Grande-PA, corresponding to 3.6 points. The score more appropriately characterizes the disability present in the individual [30].

The most frequent DPD was degree I, different from the result observed in the study developed in Buriticupu-MA, with post-discharge patients, which evidenced that most participants (76.8%) had zero DPD [31]. The presence of PD found draws attention to the need for actions towards the prevention of disabilities and longitudinal care, with the continuous evaluation of impairments and injuries and guidance on self-care [32, 33].

The clinical importance of leprosy reactions for PD is evidenced in the literature [27, 33], although the present study found no statistically significant association between them in the bivariate analysis. This result may be related to the under-recording of reactional episodes in both municipalities.

The perceived health analysis integrates the group of variables of the individual vulnerability dimension [10]. In this study, there is a significant association between the health perceived by the post-leprosy patient, with the degree of PD as evidenced in the literature, as well as greater chances for those who describe health as bad and very bad [34]. The physical disabilities caused by leprosy involve, in addition to dermatoneurological damage, psychological damage arising from the strong stigma related to these disabilities. This result reinforces the need for differentiated care for disability prevention, physical rehabilitation, and psychological follow-up in order to ensure comprehensive care [33].

The diagnosis of leprosy is considered a difficult time for the sick, requiring health professionals to be willing and prepared to carry out all guidelines to enhance healing actions. This moment requires attention in both treatment and post-discharge, to enable overcoming problems and treatment adherence and care [20, 35].

When verifying the comorbidities in isolation in the study, arterial hypertension reported by the cases was associated with the presence of the physical disability. Therefore, there is an influence of cardiovascular and metabolic diseases, especially hypertension as complicating conditions. The importance of addressing in an integrated way the diseases experienced by people with leprosy at the beginning of polychemotherapy stands out since the drugs used to prevent neural damage or reduce them can also contribute to the emergence of other health conditions. Prolonged corticosteroid therapies can cause different adverse effects on affected people, including the development of hypertension, diabetes, oral diseases, among others [36, 37].

A limitation of the study was the use of the official databases of the Unified Health System as a data source. The high proportion of unapproached/non-located cases refers to the population dynamics in the territory of the municipalities mainly. In addition, there is the under-registration of reactional episodes, which, despite their relevance, do not have their own surveillance system.

Considering the analyses performed in the census

population research, the percentage of cases evaluated in the study in relation to the number of cases reported at the database did not compromise the results of the study but is considered a limitation of the study. The period from 2001 to 2014 was considered extensive and with the possibility for several changes in the life of this population, as described in the method.

CONCLUSION

The study allowed identifying that the physical disabilities produced by leprosy are associated with the variables of individual vulnerability, namely: gender, age group, hypertension, operational classification, clinical form and perceived health after leprosy. The epidemiological importance of leprosy in Piauí and the need to qualify control actions are reinforced. These results contribute to the interventional propositions in coping with the disease, emphasizing the need for follow-up of people affected in the post-discharge period. The importance of intersectoral actions focusing on comprehensive care is reinforced. Nursing has an important and necessary role in leprosy control actions, ranging from prevention, diagnosis, treatment, and recovery of the patient, in addition to the evaluation of their contacts.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This research was approved by the Research Ethics Committee (REC) of the Federal University of Piauí, Brazil under opinion no. 1.115.818.

HUMAN AND ANIMAL RIGHTS

The fundamental ethical and scientific requirements for research involving human beings were met, according to Resolution 466/12 of the Brazilian National Health Council.

CONSENT FOR PUBLICATION

Written informed consent was obtained from the participants.

STANDARDS OF REPORTING

STROBE guidelines and methodologies were followed.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

ACKNOWLEDGEMENTS

None.

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