http://www.periodicos.uem.br/ojs/index.php/CiencCuidSaude
ISSN on-line1984-7513
DOI: 10.4025/cienccuidsaude.v20i0.56544

ORIGINAL ARTICLE

FACTORS ASSOCIATED WITH LEPROSY IN COMMUNITY HEALTH AGENTS IN THE AMAZON REGION

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ABSTRACT

Objective: to investigate the factors associated with the occurrence/incidence of leprosy in Community Health Agents (CHA) in Palmas, Tocantins. **Methods**: a cross-sectional study was conducted by applying a questionnaire to 301 CHAs between 2017 and 2018, in Palmas, Tocantins. Bivariate analysis was performed using Pearson's chi-square test and calculation of prevalence ratios (PR) with 95% confidence intervals (95% CI). **Results**: the average age of the CHAs was 47 years old, with a minimum of 20 and a maximum of 67 years old. Odds ratios significantly associated were age ≥ 36 years old (OR: 3.65 CI: 1.58-8.44), women (OR: 2.58 CI: 1.16-5.75), UBS located outside the hospital. master plan (OR: 2.22 CI: 1.37-3.59), family income less than 2 minimum wages (OR: 3.50 CI: 2.14-5.74), between 10 and 18 years of time served as CHA (OR: 3.04 CI: 1.46-6.32), have training for leprosy (OR: 2.41 CI: 1.24-4.69), a higher number of leprosy cases followed up in the territory (OR:2.59 CI:1.36-4.94) and from another state (OR:1.67 CI:1.05-2.67). Having a family history was the only independent associated factor (OR:1.83 CI:1.10-3.02). **Conclusion**: leprosy in CHA was associated with unfavorable sociodemographic conditions, greater experience with the topic, with the isolated factor having a sick family member, with lower income and who followed more cases.

Keywords: Leprosy. Community health workers. Social determinants of health. Epidemiological Monitoring.

INTRODUCTION

Leprosy is a hyperendemic disease in different places around the world and still has a neglected disease character, causing an impact on public health and damage to the lives of affected people[1]. In 2019, there were approximately 202,175 new cases of leprosy in the world and approximately 14.5% of this total occurred in the Americas, with Brazil being responsible for 27,863 new cases, that is, 79.1% of the cases were registered in the Americas[2]. In the country, the overall detection coefficient was 11.2 new cases per 100,000 inhabitants in 2019[3].

As a result of the complexity of the disease and its heterogeneous distribution in different regions of the country, there is the need to implement innovative control measures to achieve indicators that reflect the epidemiological reality and promote the reduction of hidden prevalence[4-7]. Tocantins was the second state in the country with the highest coefficient of detection of new cases in 2019 (87.3/100 thousand in habitants)[1] and Palmas, its capital, was the most hyperendemic in the same year in Brazil, with 204.2/100 thousand in habitants[3].

This epidemiological scenario reflects the implementation of the Palmas Free of Leprosy project from 2016 to 2019[8]. This project promoted the execution of training for leprosy at the locus of the Primary Care units in Palmas with the enhancement of the service's operational capacity. Thus, all professionals from the Family Health Teams (*Equipes de Saúde da Família* - EqSF) were trained and involved in the search of strategies for suspected cases, especially the Community Health Agent (CHA)[8].

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The training of the CHAs was provided with the EqSF in the discussion of clinical cases in health units and at a specific time for the category considering the specificities of the profession. These strategies proved to be effective, considering that the increased capacity of the CHAs to recognize the signs and symptoms of suspected cases in the territory promoted a high demand for scheduling for the evaluation of these cases in the health units. As a result of this activity, we observed that these professionals also started to demand, regularly, assessments of themselves and their families for suspected leprosy.

Tocantins municipalities have strong social vulnerabilities for a greater occurrence of leprosy[9], including Palmas, a city of immigrants as it is the newest capital in the country. Scientific evidence indicates that, amid these vulnerabilities, household contacts of people with leprosy are at high risk of developing the disease[10-11]. Additionally, the occurrence of leprosy cases in household contacts is probably associated with a combination of greater exposure to cases with a high bacillary load[11] and the sharing of social vulnerabilities within the same family, for example, migration, lower family income, and conditions unfavorable of life[12-13].

Considering the hyperendemic situation of the municipality after the implementation of the Palmas Free of Leprosy project and the gap in knowledge about leprosy and vulnerabilities in this territory, this study aims to investigate the factors associated with the occurrence/incidence of leprosy in Community Health Agents (CHA), in Palmas, Tocantins.

METHODOLOGY

This is a cross-sectional study, developed in the city of Palmas, the country's newest capital, whose estimated population in 2019 is almost 300 thousand inhabitants[14]. The Health Care and Surveillance Network (*Rede de Atenção e Vigilância em Saúde* - RAVS) of the Health Department of Palmas, established by Ordinance number 457/2019, states the form of organization of the municipal health system, which started to have as defining characteristics the polyarchic arrangement, the work in a team, coordination and longitudinality of care, information technology as a work tool, exchange and cooperation between the different points of health care with the objective of comprehensive care[15]. RAVS has 3 administrative districts subdivided into 8 health territories with their respective 34 Community Health Centers (CHC) and other points of care. The care network has 85 Family Health Teams, 75 Oral Health Teams, 506 CHAs, 13 Expanded Family Health Centers (*Núcleos Ampliados de Saúde da Família* - NASF) and 1 Street Clinic Team.

Of the 506 CHAs linked to the primary health care network in Palmas, CHAs linked and working in teams of the Family Health Strategy were included in the study, totaling 474 CHAs.We excluded from the study the CHAs who were deviating from their duties, on sick leave, on leave for personal interests, or appointed to hold positions. Of the 474 CHAs included in the study, 40 were on vacation during the collection period and the others did not attend the invitation. Therefore, the study population consisted of 301 (63.60%) CHAs.

For data collection, the following steps were followed: 1) Presentation of the project to the municipal manager; 2) Presentation of the project to the managers of the Community Health Centers (CHC) and agreement on the dates for the interviews with the CHAs; 3) Invitation for agents to participate in the survey, made by the CHC managers 10 days before the interview date; 4) Conducting data collection by two experienced researchers in the area, trained and supported by medical students to support and organize the logistics of collection.

Participants answered a standardized questionnaire with structured questions. This form was pre-tested with CHAs working in Family Health Teams (EqSF) in the city of Porto Nacional-TO. After necessary adjustments, data collection took place between August and November 2018. In a private room, the researchers presented the Informed Consent Form (ICF) and then applied the questionnaire and each CHA responded individually. The CHAs of each Health Center were invited to answer the questionnaire individually in a reserved room with an average capacity of 20 people. A single meeting with an average duration of 30 minutes was necessary to

complete the questionnaire in each Health Center.

The sociodemographic, clinical, service performance and training variables included in the study were a place of birth, sex/gender, age group, location of the Community Health Center where the CHA works, place of residence, race/color, family income, time of service such as CHA, training in leprosy, number of leprosy cases monitored in the territory, diagnosis of leprosy among family members and length of residence in Palmas. The outcome variable of this study was defined by the CHA's report having been diagnosed with leprosy.

Bivariate analysis was performed using Pearson's chi-square test and calculation of prevalence ratios (PR) with 95% confidence intervals (95% CI). Multiple logistic regression was performed considering $p<0.20$ to include the variable in the logistic model and $p<0.05$ to keep the variable in the final model, but the variables with $p>0.05$ remained in the model to adjust for possible confounding factors. Variables that showed collinearity were not included in the final model. The adjusted odds ratio (OR) was used as the measure of association between sociodemographic, clinical, service performance, and training characteristics and the CHA having been affected by leprosy, considered significantly different from 1 when the confidence interval was 95% did not include this value.

The study was approved by the Research Ethics Committee of the Centro Universitário Luterano de Palmas – Tocantins (CAAE nº 79187717.7.0000.5516/CEP/ULBRA, opinion nº 2.586.134).

RESULTS

Of the 301 CHA participating in the study, the mean age of the CHAs was 47 years old, with a minimum of 20 and a maximum of 67 years old. Most were female (77.41%). Almost 20% reported that they had a medical diagnosis of leprosy, 30.00% reported that a family member had or is suffering from leprosy and more than half of the CHAs were married and born in the state of Tocantins (Table 1).

Table 1. Characterization of Community Health Agents from Palmas, Tocantins, Brazil, 2017 – 2018.

Variables	n (301)	%
Placeofbirth/state		
Tocantins	159	52.82
Otherstates	142	47.18
Sex/Gender		
Female	233	77.40
Male	68	22.60
Marital Status		
Married	153	50.83
Divorced/separated	25	8.31
Single	82	27.24
Common-lawmarriage	35	11.63
Widow	6	1.99
Leprosydiagnosis		
No	241	80.07
Yes	60	19.93
Leprosy diagnosis among family members		
No	213	70.76
Yes	88	29.24

Source: own authorship.

Table 2 shows the sociodemographic factors associated with leprosy in CHAs in the bivariate analysis. At this stage, higher odds ratios were found for CHAs aged ≥ 36 years old (OR:3.65 CI: 1.58-8.44), women (OR: 2.58 CI: 1.16-5.75), UBS located outside the master plan (OR: 2.22 CI: 1.37-3.59), family income less than 2 minimum wages (RC: 3.50 CI: 2.14-5.74), between 10 and 18 years of service as CHA (OR: 3.04 CI: 1.46-6.32), have training for leprosy (RC:2.41 CI: 1.24-4.69), a higher number of leprosy cases followed in the territory (OR:2.59 CI: 1.36-4.94), born in another state (OR:1, 67 CI: 1.05-2.67) and family member who had or is with leprosy (OR:9.68 CI: 5.41-17.32) (Table 2).

Table 2. Bivariate analysis of factors associated with the illness of Community Health Agents from leprosy in the city of Palmas, capital of Tocantins, Brazil, 2017 – 2018.

Variable	Total n	CHA had leprosy n	%	Prevalence Ratio	CI 95%*	*p*-value
Age group						
<35	81	6	7.41	1	-	
36 – 45	124	28	22.58	3.65	1.58-8.44	≤ 0.001
>46	96	26	27.08	3.04	1.32-7.03	0.004
Sex/Gender						
Male	68	6	8.96	1	-	0.0103
Female	233	54	23.18	2.58	1.16-5.75	
UBS location						
Master plan	164	21	12.80	1	-	0.0007
Out of master plan	137	39	28.47	2.22	1.37-3.59	
Placeofresidence						
Rural	20	4	20.00	1	-	0.9939
Urban	281	56	19.93	0.99	0.40-2.46	
Race/skincolor						
White	32	8	25.00	1	-	
Asian	10	2	20,.00	0.80	0.20-3,17	0.5231
Brown	214	43	20.09	0.80	0.41-1.55	0.5231
Black	45	7	15.56	0.62	0.25-1.54	0.3024
Educationlevel						
>12yearsofstudy	158	27	17.09	1	-	
9 to 12yearsofstudy	98	21	21.43	1.56	0.86-2.82	0.1502
≤ 8 yearsofstudy	45	12	26.67	1.25	0.75-2.09	0.3872
Family income						
≥3 wages	162	20	12.35	1	-	
2-3 wages	72	11	15.28	1.23	0.62-2.44	0.5414
< 2 wages	67	29	43.28	3.50	2.14-5.74	0.0000
Length of service as CHA						
≤9 years	110	13	11.82	1	-	
10 to 18years	166	38	22.89	3.04	1.46-6.32	0.0031
≥19 years	25	9	36.00	1.93	1.08-3.46	0.0203
Training in leprosy						
No	90	9	10.00	1	-	0.0048
Yes	211	51	24.17	2.41	1.24-4.69	
Leprosy cases followed up in the territory						
None	57	9	15.79	1		
1 to 3	144	38	26.39	1.67	0.86-3.22	0.1095
≥ 4	100	41	41.00	2.59	1.36-4.94	0.0011
Family withleprosy						
No	213	12	5.63	1	-	0.0000
Yes	88	48	54.44	9.68	5.41-17.32	
Placeofbirth						
Tocantins	159	24	15.09	1	-	0.0262
Others	142	36	25.35	1.67	1.05-2.67	
Residence time in Palmas						
≤ 10 years	35	2	5.71	1	-	
10 a 20years	80	12	15.00	2.62	0.61-11.11	0.1611
> 20 years	186	46	24.73	4.32	1.10-17.01	0.0123

* ConfidenceInterval.
Source: own authorship.

Table 3 shows the variables included in the final logistic regression model. The highest independent odds ratio for leprosy in CHA was having a history of an affected family member, family income, and more frequent follow-up of cases of the disease in the territory (Table 3).

Table 3. Logistic regression of factors associated with the illness of Community Health Agents due to leprosy in the city of Palmas, capital of Tocantins, Brazil, 2017-2018.

Variable	*Adjusted OR*[*]	CI[**]	p-value
Family withleprosy	16.01	7.19-35.60	0.000
Family income	2.42	1.53-3.84	0.000
Leprosy cases followed up in the territory	2.21	1.18-4.14	0.012
Advanced age group	1.31	0.71-2.41	0.383
Sex/Gender	2.73	0.88-8.45	0.081
Training in leprosy	1.96	0.73-5.24	0.179
Time as CHA	1.37	0.67-2.79	0.383
UBS location	1.64	0.72-3.70	0.232

[*]OddsRatio, [**]Confidence Interval.
Source: own authorship.

DISCUSSION

For the first time, a study addresses the association of sociodemographic, clinical, service performance, and training factors with leprosy in CHA. The results provided evidence that the illness of CHA due to leprosy in the most hyperendemic capital of Brazil was associated with unfavorable sociodemographic conditions and greater experience with the topic, with the isolated factor having a sick family member, lower-income and monitoring of more cases in the territory.

Although the study did not analyze the CHA's degree of kinship with the affected family member, having a family member diagnosed with the disease in the past or present was the strongest independent associated factor for the CHA's illness due to leprosy in the multivariate analysis. Weobserved in the literature that the intra-household contacts of people with multibacillary leprosy have up to 8 times the chance of getting sick[11], especially first-degree relatives with consanguineous ties, that is, genetic susceptibility[16]. Living with a family member with leprosy is strongly associated with the development of the disease[17-19].

The overlapping of leprosy cases in a Home Contact Network (*Rede de Contato Domiciliar* - RCD) identified that the repetition of cases in the same RCD represents a sentinel indicator of greater epidemiological severity for surveillance in the primary health care network[20-21]. A cohort study robustly showed that the occurrence of leprosy in the assessment of contacts was estimated to be 37 times greater than the cohort of 100 million Brazilians and 50 times greater than the rate recorded for the general population of Brazil, and showed that the risk associated with the increased proximity of a primary case of leprosy, it can replace the geographic and individual risk factors of leprosy, becoming a subsequent case of this disease[7].

The identification of leprosy cases among family members reinforces that, in addition to contacts that constitute a population at high risk for infection, they can act as a source of infection[22]. Also, in the execution of the Palmas Free of Leprosy project, the "gold" strategy for detecting cases by contact assessment was the adoption of the expanded concept of contact considering the natural history of the disease, that is, the average period of incubation and the time required for clinical manifestations. In the fieldwork, when a case was diagnosed, the search for its contacts extended to the search for the index case, and this was applied to primary care health workers. Thus, the significant increase in the detection of CHA by evaluation of contacts was also influenced by the better diagnostic capacity of professionals to detect leprosy cases under field conditions[5]. The training of CHAs in leprosy surveillance and control increased this expertise and was able to promote active surveillance.

Corroborating previous research, these results demonstrate a higher odds ratio for leprosy in areas of neglected populations[13,23], a fact verified by the association of leprosy in low-income CHAs with more frequent follow-up of cases in the territory. In the bivariate analysis, the disease was significantly higher in CHAs who work in health units located outside the region of the municipality's master plan, that is, in peripheral regions whose population is more socioeconomically vulnerable and part of the houses are located in occupied areas. Lower-income was also significantly related to a higher

odds ratio for leprosy in the bivariate and multivariate analysis, as identified in other scenarios[19,24]. It is a fact that unfavorable living conditions, as well as the difficulty of accessing professionals trained at the primary care level, interfere in the detection and distribution of leprosy[5,11].

CHAs living in the municipality for more than 20 years and those over 36 years old had a significantly greater chance of having leprosy, which suggests the possibility of prolonged incubation time[25], with age being directly related to the duration of illness. There is a study that does not show a significant difference in the results of skin color[24], but on the other hand, there are studies that, in addition to finding ethnic-racial differences (greater involvement in browns and blacks), also identified a higher incidence in poor and poorly educated population [13].

In this study, the level of education was not significantly associated with leprosy, unlike other scenarios[13,19,22]. This was possibly due to the condition that the CHAs had access to a higher education course, but were unable to change their standard of living.

A higher odds ratio (bivariate and multivariate analysis) for leprosy in CHA was identified as a result of the number of cases of the disease followed by them in the territory and the longer time of service as CHA. On the other hand, these factors may have been influenced by the fact that the CHAs with longer service time has more opportunity to follow up on cases and, therefore, gain more experience about the signs and symptoms with repercussions for their learning by experience and more accuracy for suspicion.

Although a statistical difference was found for the higher odds ratio of leprosy in female CHAs, official data from the Ministry of Health prevailed in cases of leprosy among the male population[1], whereas in a recent study, women were identified as the most prevalent[7]. This result indicates that health services need to rethink and devise strategies to overcome access barriers from a gender perspective, considering the singularities of being a woman and being a man in a social context.

The limitations of this study are associated with the memory bias, which can occur when answering the forms, and the non-inclusion of variables that could better understand the illness of these professionals, such as time and proximity of the CHA's place of residence to the workplace, working time in the last EqSF and relationship/closeness with the family member with leprosy. Despite these limitations, the strengths of the study overlap, considering this to be the first approach on the determinants of illness in CHAs due to leprosy carried out in the country. New possibilities open up for advancing studies on the exposure of health professionals to leprosy.

Therefore, scientific studies show that unfavorable sociodemographic and environmental conditions are associated with the maintenance of the transmission chain of Mycobacterium leprae and therefore socially vulnerable areas have high leprosy detection coefficients[7,9,13,20,24]. Added to these conditions, the operational capacity of the health services in Palmas can explain the occurrence of leprosy in the general population and CHAs.

CONCLUSION

This study is the first to identify factors associated with leprosy in CHAs. It brought evidence that leprosy in these professionals was associated with unfavorable sociodemographic conditions, greater experience with the topic, with the isolated factor having a sick family member, lowerincome, and more frequent follow-up of cases.

Considering the CHA's vulnerabilities to illness due to leprosy, the health of this worker must be part of the mutual commitments between managers and other team members, as investments are needed not only in the specific training of these professionals but in the promotion of quality of life, health care and the work process performed by them.

FATORES ASSOCIADOS À HANSENÍASE EM AGENTES COMUNITÁRIOS DE SAÚDE DA REGIÃO AMAZÔNICA

RESUMO

Objetivo: investigar os fatores associados à ocorrência/incidência de hanseníase em Agentes Comunitários de Saúde (ACS), em Palmas, Tocantins. **Métodos:** estudo transversal, realizado mediante a aplicação de questionário para 301 ACS entre os anos de 2017 e 2018, em Palmas, Tocantins. Realizou-se análise bivariada com a aplicação do teste de qui-quadrado de *Pearson* e o cálculo das razões de prevalência (RP) com intervalos de 95% de confiança (IC 95%). **Resultados:** a idade média dos ACS foi de 47 anos, com mínima de 20 e máxima de 67 anos. As razões de chance significativamente associadas foram idade ≥ 36 anos *(RC:3,65 IC:1,58-8,44),* mulheres *(RC:2,58 IC:1,16-5,75)*, UBS localizada fora do plano diretor *(RC:2,22 IC:1,37-3,59)*, renda familiar inferior a dois salários mínimos *(RC:3,50 IC:2,14-5,74)*, entre 10 e 18 anos de tempo de serviço como ACS*(RC:3,04 IC:1,46-6,32)*, ter capacitação para hanseníase *(RC:2,41 IC:1,24-4,69)*, maior número de casos de hanseníase acompanhados no território *(RC:2,59 IC:1,36-4,94)* e naturalidade de outro estado *(RC:1,67 IC:1,05-2,67)*. Ter história familiar foi o único fator associado independente (*OR:1,83 IC:1,10-3,02).* **Conclusão:** a hanseníase em ACS foi associada a desfavoráveis condições sociodemográficas, maior experiência com o assunto, tendo como fator isolado ter um familiar doente, de menor renda e que acompanhou mais casos.

Palavras-chave: Hanseníase. Agentes Comunitários de Saúde. Determinantes Sociais da Saúde. Monitoramento Epidemiológico.

FACTORES ASOCIADOS A LA LEPRA EN AGENTES COMUNITARIOS DE SALUD DE LA REGIÓN AMAZÓNICA

RESUMEN

Objetivo: investigar los factores asociados a la incidencia de lepra en Agentes Comunitarios de Salud (ACS), en Palmas, Tocantins-Brasil. **Métodos**: estudio transversal, realizado mediante la aplicación de cuestionario para 301 ACS entre los años 2017 y 2018, en Palmas, Tocantins-Brasil. Se realizó análisis bivariado con la aplicación delaprueba de chi-cuadrado de Pearson y el cálculo de la razón de prevalencia (RP) con intervalos de 95% de confianza (IC 95%). **Resultados**: el promedio de edad de los ACS fue de 47 años, con mínima de 20 y máxima de 67 años. Las razones de probabilidad significativamente asociadas fueron edad ≥36 años (*RC:3,65 IC:1,58-8,44*), mujeres (*RC:2,58 IC:1,16-5,75*), UBS ubicada fuera del plan director (*RC:2,22 IC:1,37-3,59*), ingresos familiares por debajo de 2 sueldos mínimos (*RC:3,50 IC:2,14-5,74*), entre 10 y 18 años de servicio como ACS (*RC:3,04 IC:1,46-6,32*), tener capacitación para lepra (*RC:2,41 IC:1,24-4,69*), mayor número de casos de lepra acompañados en el territorio (*RC:2,59 IC:1,36-4,94*) y naturalidad de otro estado (*RC:1,67 IC:1,05-2,67*). Tener historia familiar fue el único factor asociado independiente (*OR:1,83 IC:1,10-3,02*). **Conclusión**: la lepra en ACS fue asociada a condiciones adversas sociodemográficas, mayor experiencia con el asunto, teniendo como factor aislado tener un familiar enfermo, de menor renta y que acompañó más casos.

Palabras clave: Lepra. Agentes Comunitarios de Salud. Determinantes Sociales de la Salud. Monitoreo Epidemiológico.

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Submitted: 14/09/2020
Accepted: 12/08/2021