Cogitare Enfermagem

ORIGINAL ARTICLE

EPIDEMIOLOGICAL TREND FOR LEPROSY IN MINAS GERAIS, 1995-2015

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ABSTRACT

Objective: To analyze the epidemiological leprosy trend in Minas Gerais from 1995 to 2015, focusing on grade-2 physical disability.

Method: An ecological time series study, where the new cases of leprosy notified from 1995 to 2015 were selected. The epidemiological indicators were calculated by year of detection. The Prais-Winsten regression was used for trend analysis, with a 5% statistical significance.

Results: 50,673 new leprosy cases were recorded in the state. There was a decreasing trend of the detection rates in the general population of -5.64; in children under 15 years old, it was -5.64; and with a grade-2 physical disability, it was -6.97. The proportion of new cases with grade-2 physical disability showed a steady trend.

Conclusion: Endemic maintenance in Minas Gerais is evidenced with late detection and underreporting of cases, requiring greater investment in actions to eliminate and control the disease.

DESCRIPTORS: Leprosy; Epidemiology; Time Series Studies; Individuals with disabilities; Neglected diseases.

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ARTIGO ORIGINAL / ARTÍCULO ORIGINAL

TENDÊNCIA EPIDEMIOLÓGICA DA HANSENÍASE EM MINAS GERAIS (1995-2015)

RESUMO

Objetivo: analisar a tendência epidemiológica da hanseníase em Minas Gerais no período de 1995 a 2015, com foco no grau 2 de incapacidade física.

Método: estudo ecológico de séries temporais, em que foram selecionados os casos novos de hanseníase notificados no período de 1995 a 2015. Os indicadores epidemiológicos foram calculados por ano de detecção. Para a análise de tendência, utilizou-se a regressão de Prais-Winsten, com significância estatística de 5%.

Resultados: foram registrados 50.673 casos novos de hanseníase no estado. Observou-se tendência Descending das taxas de detecção na população geral de -5,64, em menores de 15 anos de -5,64 e com grau 2 de incapacidade física de -6,97. A proporção de casos novos com grau 2 de incapacidade física apresentou tendência Stationary.

Conclusão: evidencia-se manutenção da endemia em Minas Gerais com detecção tardia e subnotificação de casos, sendo necessário maior investimento em ações de eliminação e controle da doença.

DESCRITORES: Hanseníase; Epidemiologia; Estudos de Séries Temporais; Pessoas com deficiência; Doenças negligenciadas.

TENDENCIA EPIDEMIOLÓGICA DE LA LEPRA EN MINAS GERAIS, 1995-2015

RESUMEN

Objetivo: analizar la tendencia epidemiológica de la lepra en Minas Gerais durante el período de 1995 a 2015, con énfasis en el grado 2 de incapacidad física.

Método: estudio ecológico de series temporales en el que se seleccionaron los casos nuevos de lepra notificados durante el período de 1995 a 2015. Los indicadores epidemiológicos se calcularon por año de detección. Para analizar la tendencia se utilizó la regresión de Prais-Winsten, con una significancia estadística del 5%.

Resultados: se registraron 50.673 casos nuevos de lepra en el estado. Se observó una tendencia decreciente en los índices de detección en la población general (-5,64), en menores de 15 años (-5,64) y con grado 2 de incapacidad física (-6,97). La proporción de casos nuevos con grado 2 de incapacidad física presentó una tendencia estacionaria.

Conclusión: Se hace evidente el mantenimiento endémica en Minas Gerais con detección tardía y el subnotificación de casos, lo que requiere una mayor inversión en acciones para eliminar y controlar la enfermedad.

DESCRIPTORES: Lepra; Epidemiología; Estudios de series temporales; Personas con discapacidades; Enfermedades desatendidas.

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INTRODUCTION

Leprosy, an infectious disease caused by Mycobacterium leprae, mainly affects the skin and peripheral nerves and can cause physical disabilities and deformities, especially in the eyes, hands and feet, if not diagnosed and treated early.[1] The physical disability is rated on a scale from 0 to 2, where grade 0 corresponds to no impairment of hands, eyes and feet due to leprosy. Grade 1 is characterized by decreased muscle strength and/or decreased or loss of sensation in the eyes, hands and feet. Grade 2 refers to deformities in these areas,[2] being responsible for the social stigma, prejudice and discrimination to the people affected by the disease.[3-5]

It is currently mostly found in areas with greater social vulnerability, in underdeveloped and developing countries, including Brazil,[6] which ranks second in the absolute number of new cases registered in the world and leads the endemic countries of the Americas in the prevalence and detection of new cases. In 2017, 2,010,671 new cases of leprosy were recorded in 150 countries, of which 26,875 occurred in Brazil. Of these cases, 7.3% had grade-2 physical disability.[7]

The Midwest, North and Northeast regions of the country have the highest rates for leprosy prevalence and detection. However, some Southeastern states also have endemic regions, which fits Minas Gerais with a heterogeneous distribution of new cases.[8-9]

Given this scenario and due to its characteristics, magnitude and transcendence, the need was identified to conduct a study that analyzes the epidemiological behavior of leprosy in Minas Gerais with a focus on permanent physical disabilities, in order to contribute to the direction of strategies for the control and early diagnosis of the disease. Thus, the study aimed to analyze the epidemiological trend of leprosy in Minas Gerais from 1995 to 2015, focusing on grade-2 physical disability.

METHOD

An ecological study of time series based on the records obtained from the Notification Disease Information System (*Sistema de Informação de Agravos de Notificação*, SINAN), made available by the State Coordination of Sanitary Dermatology (*Coordenadoria Estadual de Dermatologia Sanitária*, CEDS) of Minas Gerais State Secretariat of Health (*Secretaria de Estado da Saúde de Minas Gerais*, SES/MG) in April 2016. The selected cases were those leprosy cases detected as new, diagnosed from 1995 to 2015, for residents in Minas Gerais at the date of the diagnosis, excluding records with misdiagnosis and duplicity. The study period was delimited based on the availability of the morbidity data.

The population data were obtained from the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística*, IBGE), through the page of the Informatics Department of the SUS (DATASUS), available from the 2000 and 2010 demographic censuses, of the 1996 population count and of the population projections of the other years.

The data extracted from the SINAN was released in the Microsoft Excel software version 2010 and decoded according to the Sinan-NET data dictionary (versions 1997 to 2006 and 5.0). Subsequently, they were recorded to construct the study variables.

To evaluate the temporal evolution of leprosy four epidemiological indicators recommended by the Ministry of Health (*Ministério da Saúde*, MS) were used: detection rate of new leprosy cases per 100,000 inhabitants, used to measure the morbidity force, magnitude and tendency of the disease; detection rate for new leprosy cases in the population aged zero to 14 years old per 100,000 inhabitants, which measures the recent transmission force of the endemic and its trend; detection rate of new leprosy cases with

grade-2 physical disability at diagnosis time per 100,000 inhabitants which, together with the overall detection rate, monitors the trend for timely detection of new cases; and proportion of new leprosy cases with physical disability grade-2 at the time of diagnosis among new cases detected and evaluated in the year, which assesses the effectiveness of timely and \/ or early case detection activities.[2]

The indicators were calculated by year of diagnosis according to the recommendations of the Guidelines for surveillance, care and leprosy elimination as a public health problem,[2] using the state of Minas Gerais as analysis unit.

Data analysis consisted of descriptive analysis and trend analysis, where the results were compared with the parameters established by the Ministry of Health[2] and with the scientific literature.

For the trend analysis, the Prais-Winsten linear regression model was used. The statistical significance of the trend was admitted when the model obtained an error probability of 5% (p<0.05).

This model is indicated to correct the serial autocorrelation that often occurs in population data measurements, since it tends to overestimate the adjustment measures, providing incorrect interpretations regarding the trend of the measurements. And, also for not allowing the analysis of time series with few years because, when the number of points is very small, the small statistical power of regression analysis hinders the identification of a significant trend.[10]

Firstly, the graphical arrangement of the sequence of annual indicator values from 1995 to 2015 was analyzed in order to outline the analytical procedures. Based on the graphical analysis, the trend analysis was performed in three periods: 1995 to 2015, 1995 to 2005 and 2006 to 2015, aiming to detect behavioral variations over the period.

The dependent variables (Y) were the logarithms of the detection rates of new leprosy cases in the general population and in children under 15 years old, new leprosy cases with grade-2 physical disability at the time of diagnosis and the proportion of new leprosy cases with grade-2 physical disability at the time of diagnosis among the new cases detected and evaluated in the year. The independent variables (X) were the years of each period.

Due to a change in the grade-2 disability definition criteria that had an impact on the 2007 notifications and could influence the trend analysis due to inconsistent information,[11-12] this year's data were excluded from the trend analysis of the following indicators: detection rate of new leprosy cases with grade-2 physical disability at diagnosis and proportion of new leprosy cases with grade-2 physical disability at the time of diagnosis among the new cases detected and evaluated in the year.

After estimating the coefficient values of the dependent variables, the annual rate of change was calculated (APC = $[-1+10^b]*100\%$). From its analysis it can be said that a trend is increasing when the rate of change is positive, decreasing when the rate of change is negative and steady when there is no significant difference between its value and zero.[10]

The final stage of the modeling consisted of calculating the 95% confidence intervals (95% CIs) of the study measures. Since the coefficient is estimated by linear regression, the confidence interval of this coefficient should be applied to calculate the 95% confidence interval of the measurement ($95\%CI=[-1+10^{bminimum}]*100\%$; $[-1+10^{bmaximum}]*100\%$).[10]

Microsoft Excel version 2010 and Stata version 12 (Stata Corp. College Station, United States) were used for the analyses.

This study is one of the axes of the project referred to as "Epidemiological analysis for leprosy in the state of Minas Gerais", developed in the Center for Studies and Research on Leprosy (*Núcleo de Estudos e Pesquisas em Hanseníase*, NEPHANS) of the Nursing School of the Federal University of Minas Gerais (*Universidade Federal de Minas Gerais*,

UFMG), approved by the Committee of Ethics and Research with Human Beings (*Comitê de Ética e Pesquisa com Seres Humanos*, COEP) under Opinion No. 490,456.

RESULTS

Between 1995 and 2015 there were 50,673 new leprosy cases in the state of Minas Gerais, resulting in a mean overall detection rate of 13.12 (± 4.87) new leprosy cases per 100,000 inhabitants. The mean age was 44.22 years old (± 18.61). Although the highest prevalence occurred in adults (n=48,015; 94.8%), 2,658 (5.2%) new cases were detected in children under 15 years old, representing a mean detection rate of 2.52 (± 1.01) new cases of leprosy in children under 15 years old per 100,000 inhabitants.

The mean detection rate for new cases with grade-2 physical disability was 1.49 (± 0.61) and the mean percentage of new cases with grade-2 physical disability at the diagnosis was 11.2%.

The trajectory of the detection rate for new leprosy cases in the general population is displayed in Figure 1. The detection rate for new leprosy cases in Minas Gerais showed a significant decreasing trend ($p<0.001$) in the period from 1995 to 2015, with a mean annual variation of -5.64% (95% CI -8.32; -2,88). However, a steady pattern ($p=0.417$) was observed between 1995 and 2005 and a significant downward trend ($p<0.001$) since 2006, with a mean annual variation of -9.16% (95% CI - 9.89; -8.42) (Table 1).
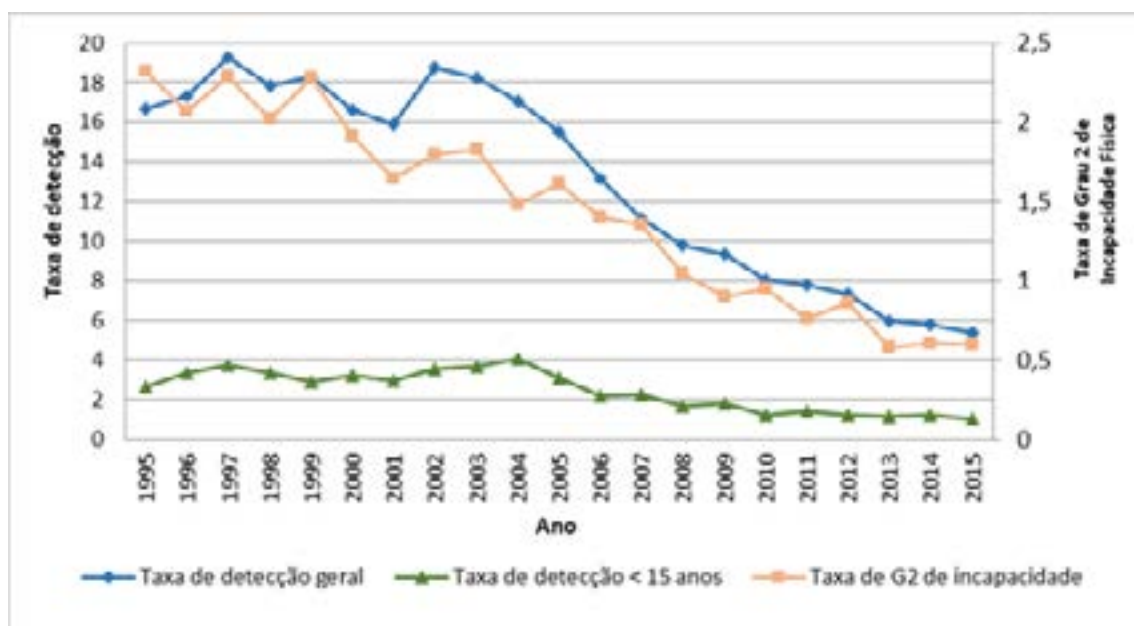

Figure 1 - Detection rates for general leprosy in children under 15 and new cases with grade-2 physical disability (per 100,000 inhabitants) in Minas Gerais. Period: 1995 – 2015. Belo Horizonte, MG, Brazil, 2019

Table 1 - Trend for the leprosy epidemiological indicators in Minas Gerais. Period: 1995 – 2015. Belo Horizonte, MG, Brazil, 2019

Indicator	Period	Annual Mean Variation (%)	CI 95%	P value*	Trend
Overall detection rate	1995 - 2015	-5,64	(-8,32; -2,88)	<0,001	Descending
	1995 - 2005	-0,59	(-2,01; 0,86)	0,417	Stationary
	2006 - 2015	-9,16	(-9,89; -8,42)	<0,001	Descending
Detection rate <15 years old	1995 - 2015	-5,64	(-8,53; -2,66)	0,001	Descending
	1995 - 2005	1,44	(-0,88; 3,81)	0,23	Stationary
	2006 - 2015	-8,27	(-10,22; -6,28)	<0,001	Descending
Proportion of new cases with grade-2 physical disability at the diagnosis	1995 - 2015	-6,97	(-8,14; -5,78)	<0,001	Descending
	1995 –2005	-3,91	(-5,04; -2,77)	<0,001	Descending
	2006 - 2015	-8,71	(-10,19; -7,20)	<0,001	Descending
Proportion of new cases with grade-2 physical disability at the diagnosis	1995 - 2015	-0,38	(-1,34; 0,58)	0,419	Stationary

The detection rate of new leprosy cases in children under 15 years old (Figure 1) also showed a significant decline (p=0.001) between 1995 and 2015, with a mean variation of -5.64% (95% CI -8.53; -2.66) per year. However, this indicator showed a steady trend (p=0.230) between 1995 and 2005, and a significant reduction (p<0.001) in the period from 2006 to 2015, with a mean annual variation of -8.27% (95% CI -10.22; -6.28).

Regarding the detection rate of new cases of leprosy with grade-2 physical disability at diagnosis (Figure 1), the results show a significant decreasing trend (p<0.001) from 1995 to 2015, with a mean variation of -6.97% (95% CI -8.14; -5.78) per year. This decline was greater from 2006 to 2015, which showed a mean annual variation of -8.71% (95% CI -10.19; -7.20) (Table 1).

The proportion of leprosy cases detected with grade-2 physical disability at diagnosis (Figure 2) showed a steady trend (p=0.419), with a cyclical variation throughout the period and a mean annual variation of -0.38% (95% CI -1.34; 0.58) (Table 1).

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Figure 2 - Proportion of new leprosy cases with grade-2 physical disability in the diagnosis in Minas Gerais. Period: 1995-2015. Belo Horizonte, MG, Brazil, 2019

DISCUSSION

Despite the decline in the detection of new leprosy cases in Minas Gerais, the state had a detection rate for new cases in the general population and minors under 15 years old above the parameters recommended by the Ministry of Health throughout the study period.[2]

The highest general and under-15 detection rates found in the period from 1995 to 2005, with a steady trend, can be attributed to implementing multi-drug therapy,[7,13] to the municipalization of the health services and to the increased coverage of the Family Health Strategy (FHS) over the years.[14-15] These factors contributed to the strengthening of the disease control and elimination actions, which highlight the training for the health professionals,[16] educational campaigns, and active search, especially in school children.[17]

There was a decline in the overall detection and new cases with grade-2 disability since 2006. It is noteworthy that the decline is expected, but in the long term, due to the long incubation period and slow evolution of the disease and because it is related to unfavorable socioeconomic conditions.[18-19] Thus, an upward trend in the detection of new cases was expected in the subsequent years due to the control strategies implemented in the previous years.[14,16-17]

In addition, the proportion of new leprosy cases with grade-2 physical disability at diagnosis showed a steady trend throughout the period. This stable trend, as well as its high profile in recent years (>10%), predicts late detection of the disease[2] and allows inferring an operational difficulty of the Primary Health Care (PHC) services in the early detection of leprosy, which may contribute to the permanence of undiagnosed cases (hidden prevalence) and to the emergence of new cases.[15,20] Therefore, the high proportion of grade-2 evidences that the incidence of the disease is not real.

This endemicity and trend profile does not provide an expectation of improvement in the near future, given the natural history of the disease.[15,21] Therefore, the control strategies should be applied continuously and consistently.[22]

Moreover, the stability and irreducibility of the proportion of new cases with grade-2

of physical disability emerges reflections on the effectiveness of the so far implemented policies and strategies for preventing and controlling the disease, demonstrating the need for new technologies and innovative strategies, aiming at the early diagnosis of the disease. [15,23]

Therefore, to analyze the trend of timely detection of leprosy, it is necessary to analyze, in addition to the detection rate of new cases with grade-2 physical disability together with the general detection rate and in children under 15 years old, the proportion of cases with grade-2 physical disability in the diagnosis, since this indicator allows to evaluate the effectiveness of the activities of the timely and/or early detection of cases.

Although the detection rate of new cases with grade-2 physical disability at diagnosis is an indicator used to monitor the timely detection trend of the disease,[2] it has some limitations because it is influenced by the detection level or intensity. Thus, it may vary from year to year and these relatively small variations may have a disproportionate effect on the rate. Moreover, in most countries, this indicator is less than one case per 100,000 inhabitants per year, which may not be as easy to explain and convince managers as to its relevance. In addition, physical disability may develop during and after the treatment, and this fact is not considered. Thus, the monitoring of physical disabilities in leprosy cannot be satisfied with this indicator alone.[24]

Despite the increased FHS coverage in Minas Gerais, there is still a concentration of care for individuals with leprosy in the referral services and it is observed that the primary care services perform the control actions on a timely basis.[25] Aspects such as lack of training, high turnover of professionals, misinformation of municipal managers and health professionals about leprosy and its epidemiological situation, and the view that the control of the disease is the responsibility of the specialized centers, have been found as factors that hinder the decentralization of the program.[26-27] Therefore, the expansion of the primary care coverage alone does not guarantee the effectiveness of the control actions and the elimination of leprosy.[28]

This scenario reveals the need to enhance effective measures aimed at early diagnosis and treatment, and at a consequent improvement of the disease detection indicators in Minas Gerais, especially in the primary care network, mainly with regard to the collective approach strategies. These refer to the active search for new cases and to the surveillance of contacts and health education for the community, in order to promote the empowerment of the individuals so that they may come to act in the promotion of their health; as well as implementing permanent leprosy education for the family health teams, thus achieving the goal of leprosy control and later leprosy elimination.

The limitations of this study are the notifications excluded in 2007 due to change in the modification of the criterion for defining grade-2 physical disabilities and the secondary data source, which may be influenced by the non-completion of all fields of the notification form or improperly throwing data into the system. However, it is noteworthy that the database available by the CEDS/SES-MG was used, which has a better consistency and information updating when compared to the public domain database.

FINAL CONSIDERATIONS

Minas Gerais remains an endemic state for leprosy, despite the decline in the general detection rates and in children under 15 years old. The stability of grade-2 physical disability proportion at high levels shows late diagnosis, maintenance of disease burden in the population with active transmission of *Mycobacterium leprae* and underreporting of cases.

Therefore, it is necessary to identify the areas of greatest risk that need greater investment in actions to eliminate and control the disease, also aimed at improving the living conditions of the population, reiterating the important role of collective health for the endemic control.

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REFERENCES

1. Lyon S, Grosso MAF. Diagnóstico e tratamento da hanseníase. In: Alves ED, Ferreira TL, Nery I, organizadores. Hanseníase: avanços e desafios. Brasília: NESPROM; 2014. p. 141-69.

2. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Vigilância das Doenças Transmissíveis. Diretrizes para vigilância, atenção e eliminação da hanseníase com problema de saúde pública: manual técnico-operacional. [Internet] Brasília: Ministério da Saúde; 2016 [access 10 mar 2016]. Available at: http://www.saude.pr.gov.br/arquivos/File/Manual_de_Diretrizes_Eliminacao_Hanseniase.pdf.

3. Organização Mundial da Saúde (OMS). Estratégia global aprimorada para redução adicional da carga da hanseníase: período do plano: 2011-2015. [Internet] Brasília: Organização Pan-Americana da Saúde; 2010 [access 15 mar 2016]. Available at: http://bvsms.saude.gov.br/bvs/publicacoes/estrategia_global_aprimorada_reducao_hanseniase.pdf.

4. Alencar M de JF de, Barbosa JC, Pereira TM, Santos SO, Eggens KH, Heukelbach J. Leprosy reactions after release from multidrug therapy in an endemic cluster in Brazil: patient awareness of symptoms and self-perceived changes in life. Cad. saúde colet. [Internet]. 2014 [access 31 out 2016]; 21(4). Available at: http://dx.doi.org/10.1590/S1414-462X2013000400014.

5. Groot R, Van Brakel WH, Vries HJC. Social implications of leprosy in the Netherlands - stigma among ex-leprosy patients in a non-endemic setting. Lepr Rev. [Internet]. 2011 [access 30 jan 2016]; 82(2). Available at: https://www.ncbi.nlm.nih.gov/pubmed/21888141.

6. World Health Organization (WHO). Global report for research on infectious diseases of poverty. [Internet] Geneva: World Health Organization; 2012 [access 21 out 2016]. Available at: https://apps.who.int/iris/bitstream/handle/10665/44850/9789241564489_eng.pdf?sequence=1.

7. World Health Organization (WHO). Global leprosy update, 2017: reducing the disease burden due to leprosy. Weekly Epidemiological Record [Internet]. 2018 [access 01 fev 2019]; 93(35). Available at: https://apps.who.int/iris/bitstream/handle/10665/274290/WER9335-445-456.pdf?sequence=1&isAllowed=y.

8. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Análise de Situação de Saúde. Saúde Brasil 2013: uma análise da situação de saúde e das doenças transmissíveis relacionadas à pobreza. [Internet] Brasília: Ministério da Saúde; 2014 [access 22 dez 2016]. Available at: http://bvsms.saude.gov.br/bvs/publicacoes/saude_brasil_2013_analise_situacao_saude.pdf.

9. Ministério da Saúde (BR). Departamento de Informática do SUS – DATASUS. Indicadores de morbidade. [Internet] 2017 [access 03 out 2017]. Available at: http://sage.saude.gov.br/#.

10. Antunes JLF, Cardoso MRA. Uso da análise de séries temporais em estudos epidemiológicos. Epidemiol. Serv. Saúde. [Internet]. 2015 [access 28 out 2016]; 24(3). Available at: http://www.scielo.br/pdf/ress/v24n3/2237-9622-ress-24-03-00565.pdf.

11. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Análise de Situação em Saúde. Saúde Brasil 2010: uma análise da situação de saúde e de Evidências selecionadas de impacto de ações de vigilância em saúde. [Internet] Brasília: Ministério da Saúde; 2011 [access 03 out 2016]. Available at: http://bvsms.saude.gov.br/bvs/publicacoes/saude_brasil_2010.pdf.

12. Freitas LRS, Duarte EC, Garcia LP. Trends of main indicators of leprosy in Brazilian municipalities with high risk of leprosy transmission, 2001–2012. BMC Infect Dis. [Internet]. 2016 [access 07 set 2017]; 16(472). Available at: http://dx.doi.org/10.1186/s12879-016-1798-2.

13. Pena MLF, Pedrosa VL, Pereira E dos S. Leprosy decline in Amazonas state, Brazil. Trop. Med. Int. Health [Internet]. 2012 [access 30 jan 2016]; 17(2). Available at: http://dx.doi.org/10.1111/j.1365-3156.2011.02900.x.

14. Gomes FBFF, Lana FCF, Oliveira RC de, Rodrigues RN. Indicadores da hanseníase no Estado de Minas Gerais e sua relação com o índice de desenvolvimento humano municipal e a cobertura da Estratégia da Saúde da Família. Reme, Rev. Min. Enferm. [Internet] 2017 [access 03 nov 2018]; 21. Available at: http://www.dx.doi.org/10.5935/1415-2762.20170073.

15. Monteiro LD, Martins-Melo FR, Brito AL, Lima M da S, Alencar CH, Heukelbach J. Tendências da hanseníase no Tocantins, um estado hiperendêmico do Norte do Brasil, 2001 – 2012. Cad Saude Publica [Internet]. 2015 [access 21 abr 2016]; 31(5). Available at: http://dx.doi.org/10.1590/0102-311X00075314 .

16. Dias RC, Pedrazzani ES. Políticas públicas na hanseníase: contribuição na redução da exclusão social. Rev. bras. enferm. [Internet]. 2008 [access 30 jan 2016]; 61(n.esp). Available at: http://dx.doi.org/10.1590/S0034-71672008000700016 .

17. Ministério da Saúde (BR). Portaria n. 1.838, de 9 de outubro de 2002. Diretrizes e estratégias para o cumprimento da meta de eliminação da hanseníase como problema de saúde pública no Brasil até 2005. Diário Oficial da República Federativa do Brasil. 2002 out. 11; Seção 1.p 121-52.

18. Brito KKG de, Andrade SS da C, Santana EMF de, Peixoto VB, Nogueira J de A, Soares MJGO. Análise epidemiológica da hanseníase em um estado endêmico do nordeste brasileiro. Rev. Gaúcha Enferm. [Internet]. 2015 [access 16 mar 2016]; 36(n.esp). Available at: http://dx.doi.org/10.1590/1983-1447.2015.esp.55284.

19. Scheelbeek PFD, Balagon MVF, Orcullo FM, Maghanoy AA, Abellana J, Saunderson PR. A Retrospective Study of the Epidemiology of Leprosy in Cebu: An Eleven-Year Profile. PLOS Negl. Trop. Dis.[Internet]. 2013 [access 30 jan 2016]; 7(9). Available at: https://doi.org/10.1371/journal.pntd.0002444.

20. Ribeiro G de C, Lana FCF. Incapacidades físicas em hanseníase: caracterização, fatores relacionados e evolução. Cogitare enferm. [Internet]. 2015 [access 21 out 2016]; 20(3). Available at: http://dx.doi.org/10.5380/ce.v20i3.41246.

21. Brito AL, Monteiro LD, Ramos Junior AN, Heukelbach J, Alencar CH. Tendência temporal da hanseníase em uma capital do Nordeste do Brasil: epidemiologia e análise por pontos de inflexão, 2001 a 2012. Rev. bras. epidemiol. [Internet]. 2016 [access 20 abr 2017]; 19(1). Available at: http://dx.doi.org/10.1590/1980-5497201600010017.

22. Blok DJ, Vlas SJ, Richardus JH. Global elimination of leprosy by 2020: are we on track? Parasit Vectors [Internet]. 2015 [access 27 nov 2016]; 8(548). Available at: http://dx.doi.org/10.1186/s13071-015-1143-4 .

23. Araújo KM da FA, Leano HA de M, Rodrigues RN, Bueno I de C, Lana FCF. Tendência de indicadores epidemiológicos da hanseníase em um estado endêmico. Rev RENE. [Internet]. 2017 [access 09 jul 2018]; 18(6). Available at: http://dx.doi.org/10.15253/2175-6783.2017000600010.

24. Declercq E. Reflections on the new WHO leprosy indicator: the rate of new cases with grade 2 disabilities per 100,000 population per year. Lepr Rev [Internet]. 2011 [access 30 jan 2016]; 82. Available at: https://pdfs.semanticscholar.org/b83c/538199b2711fbbb288abb8495a1fde0865b6.pdf .

25. Penna MLF, Grossi MA de F, Penna GO. Country profile: leprosy in Brazil. Lepr Rev. [Internet]. 2013 [access 02 fev 2016]; 84(4). Available at: https://pdfs.semanticscholar.org/3ed2/719992ea7f3a33d7436d4e0f0732b31ccc57.pdf?_ga=2.241961216.366969651.1551472060-1844289965.1549258287 .

26. Corrêa CM. Avaliação do Programa de Controle da Hanseníase no município de Governador Valadares, Minas Gerais, Brasil [dissertação]. Belo Horizonte (MG): Universidade Federal de Minas Gerais; 2016.

27. Lana FCF, Carvalho APM, Davi RFL. Perfil epidemiológico da hanseníase na microrregião de Araçuaí e sua relação com ações de controle. Esc. Anna Nery [Internet]. 2011 [access 30 jan 2016]; 15(1). Available

at: http://dx.doi.org/10.1590/S1414-81452011000100009.

28. Leano HA de M, Araújo KM da FA, Rodrigues RN, Bueno I de C, Lana FCF. Indicadores relacionados a incapacidade física e diagnóstico de hanseníase. Rev RENE. [Internet]. 2017 [access 09 jul 2018]; 18(6). Available at: http://dx.doi.org/10.15253/2175-6783.2017000600018.

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