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Análise temporal da Hanseníase na região metropolitana de Aracaju, Sergipe, Brasil: 2001-2013

Temporal analysis of leprosy in the metropolitan region of Aracaju, Sergipe, Brazil: 2001-2013

Análisis temporal de la lepra en la región metropolitana de Aracaju, Sergipe, Brasil: 2001-2013

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Resumo

No estudo foi realizada uma análise temporal e descrição do perfil epidemiológico da hanseníase na região metropolitana de Aracaju, Sergipe, Brasil, de 2001 a 2013. Foi um estudo temporal baseado em dados secundários do Sistema de Informação de Agravos de Notificação (SINAN). Neste estudo, foram analisadas as variáveis: município de residência; número de casos diagnosticados por ano de 2001 a 2013; idade; escolaridade; raça / cor da pele; classificação operacional (paucibacilar ou multibacilar); forma clínica (indeterminada, tuberculóide, dimórfica, virchowiana); e grau da deficiência, avaliado no momento da notificação e na alta médica: Graus 0, I e II. Os dados coletados foram tabulados em planilha eletrônica (*Microsoft Excel* ©) e posteriormente analisados de acordo com a estatística descritiva da medida de associação e o teste de adesão foi medido por meio do software *Bioestat* 5.0. Para a análise de tendência temporal, foi adotado o modelo de regressão polinomial simples, com centralização da variável tempo para evitar autocorrelação serial entre os termos das equações. Foi detectado um total de 3.519 casos na região de Aracaju. Predominou a forma paucibacilar. A forma clínica tuberculóide da hanseníase, foi a mais frequente. A análise temporal mostrou tendência de declínio com significância estatística (p <0,05). A forma multibacilar predominou nos municípios da Barra dos Coqueiros e Nossa Senhora do Socorro. Os resultados apontaram que a população não teve acesso adequado aos Programas de Saúde e as estratégias do Ministério da Saúde não cumpriram a meta da OMS, para a eliminação da hanseníase.

Palavras-chave: Hanseníase; Epidemiologia; Análise temporal.

Abstract

The study carried out a temporal analysis and description of the epidemiological profile of leprosy in the metropolitan region of Aracaju, Sergipe, Brazil, from 2001 to 2013. It was a temporal study based on secondary data from the Notifiable Diseases Information System (SINAN). In this study, the variables were analyzed: municipality of residence; number of cases diagnosed per year from 2001 to 2013; age; schooling; race / skin color; operational classification (paucibacillary or multibacillary); clinical form (indeterminate, tuberculoid,

dimorphic, virchowian); and degree of disability, assessed at the time of notification and upon medical discharge: Degrees 0, I and II. The data were plotted in a spreadsheet (Microsoft Excel ©) and subsequently analyzed according to the descriptive statistical measure of association and the adhesion test was measured by the Bioestat 5.0 software. For the time trend analysis, it adopted the simple polynomial regression model, the variable time centralization to avoid autocorrelation between the terms of the equations. It was detected a total of 3,519 cases in Aracaju region. The predominant form paucibacillar. Clinical tuberculoid form of leprosy was the most frequent. The temporal analysis showed a declining trend to statistical significance (p <0.05). The multibacillary predominated in the municipalities of Barra dos Coqueiros and Our Lady of Socorro. The results showed that the population did not have access to adequate health program and the Ministry of Health's strategies did not meet the goal of WHO for the elimination of leprosy.

Keywords: Leprosy; Epidemiology; Temporal analysis.

Resumén

Fue llevado a cabo un análisis temporal y la descripción del perfil epidemiológico de la lepra en la región metropolitana de Aracaju, Sergipe, Brasil, de 2001 a 2013. Fue un estudio temporal basado en datos secundarios de declaración del sistema de información (SINAN). Se analizaron las variables: municipio de residencia; número de casos diagnosticados; años; enseñanza; raza / color de piel; clasificación operacional (paucibacilar o multibacilar); forma clínica (indeterminada, tuberculoide, dimórfica, virchowiana); y grado de discapacidad, evaluados en el momento de la notificación y en el alta médica: grados 0, I y II. Los datos recogidos se tabularon en una hoja electrónica de cálculo (Microsoft Excel ©) y posteriormente se analizaron de acuerdo con las estadísticas descriptivas de la medida de asociación y de la prueba de adhesión se midió usando el software BioEstat 5.0. Para el análisis de la tendencia temporal, se adoptó el modelo de regresión polinómica simple, con la centralización de la variable tiempo para evitar autocorrelación serial entre los términos de las ecuaciones. Se detectaron 3.519 casos en la región de Aracaju. La paucibacilar predominó. La forma clínica tuberculoide fue la más frecuente. El análisis temporal mostró tendencia a la baja con significación estadística (p <0,05). La multibacilar predominado en los municipios de Barra dos Coqueiros y Nuestra Señora del Socorro. Los resultados mostraron que la población no tenía un acceso adecuado al Programa de Salud y las estrategias del Ministerio de Salud no cumplieron el objetivo de la OMS para la eliminación de la lepra.

Palabras clave: Lepra; Epidemiología; Análisis tempora.

1. Introduction

Leprosy is a chronic, infectious, contagious disease caused by the bacillus *Mycobacterium leprae*, an obligatory intracellular bacterium whose transmission occurs through the upper respiratory tract (Goulart, Penna, & Cunha, 2002; J. W. Queiroz et al., 2010). The disease is manifested by dermatological and neurological symptoms and signs, especially regarding eyes, hands and feet (Moura et al., 2013; Pimentel, Nery, Borges, Gonçalves, & Sarno, 2003). Lesions on untreated nerves can cause physical incapacities and deformities, often resulting in economic and psychological damages, as well as being responsible for the prejudice and stigma created around these patients (Amaral & Lana, 2008; Finez & Salotti, 2011).

Leprosy has high infectivity and low pathogenicity, having the domicile as the main transmission space (Cury et al., 2011; Lastória & Abreu, 2014; Moreira, Waldman, & Martins, 2008). Leprosy is considered a neglected disease, as it has prevalent infectious characteristics with a high degree of morbidity, however with low mortality (Sousa et al., 2020). The research lines on the cause of leprosy include molecular biology of the etiological agent; host genetic or immunological characteristics, not yet well known; and social determinants such as quality of life, sanitation, cultural practices, poverty, among others (Finez & Salotti, 2011; Mendonça, Costa, Melo, Antunes, & Teixeira, 2008; M. de S. Queiroz & Puntel, 1997).

In 2011, the prevalence rate of leprosy in Brazil was 1.54 cases per 10,000 inhabitants, with 33,955 new cases, 61% of which were multibacillary (MB). The distribution of the prevalence rate is quite uneven across the Brazilian regions: 3.75 in the Midwest; 3.49 in the North; 2.35 in the Northeast; 0.61 in the Southeast, and 0.44 in the South. In this region, Rio Grande do Sul has prevalence rates below the goal proposed by the WHO. Meanwhile, hyperendemic areas of the North and Northeast regions (BRASIL, 2020) have a prevalence of up to 25 cases per 10,000 inhabitants (Montenegro, Werneck, Kerr-Pontes, Barreto, & Feldmeier, 2004).

Since 1904, leprosy has become part of the compulsory notification diseases throughout the country (Pereira, Bachion, Souza, & Vieira, 2008; Santos et al., 2013), where the notification is made through the Ministry of Health/Information System for Notifiable Diseases [Sistema de Informação de Agravos de Notificação/Ministério da Saúde (SINAN/MS)]. Confirmed cases should be treated and monitored at the health facility closest to the patient's home (Alencar et al., 2012; Pereira et al., 2008; Sampaio, Madeira, Diniz,

Noia, & Zandonade, 2013). In hyperendemic areas, the active search for new cases has been an effective method for leprosy control since it allows early diagnosis and treatment, minimizing the occurrence of disabilities and reducing the spread of the disease (Moura et al., 2013). These manifestations show that leprosy is a problem that deserves to be highlighted in public policies, promoting greater awareness among health professionals regarding education actions with the population (Farias et al., 2020).

The agglutination of cases of the disease converges to multiple acts of health planning at all geographic levels that allow the insertion of health programs that reach several municipalities or regions of a state (Macedo et al., 2020).

Considering the current context of leprosy in the state of Brazil, the present study aimed to perform a temporal analysis of leprosy in the metropolitan region of Aracaju, Sergipe, Brazil, showing that such analysis can be useful for public policies of research activities and control of the disease.

2. Methods

2.1. Study area and population

The study was conducted in the municipalities from the metropolitan region of Aracaju (MRA), Sergipe, Brazil, from 2001 to 2013. The MRA was composed by the municipalities of Aracaju, Barra dos Coqueiros, Nossa Senhora do Socorro and São Cristóvão.

2.1.1. Study design and data collection

A cross-sectional, retrospective study was carried out, based on secondary data from SINAN aiming to perform a temporal analysis, describing the epidemiological profile of leprosy. All patients with leprosy, residents in these municipalities, were included in the study. The evaluation of the clinical and epidemiological information from these patients followed the diagnostic criteria used by the epidemiological surveillance system. For inclusion of the patients, several information was investigated: the data consistency; the fields' completeness, recorded in the notifications, which were used and the existence of duplicate notifications. Patients who did not present notifications registered in the online monitoring system database were excluded from the study.

The following variables were analyzed: municipality of residence; number of cases diagnosed, per year, from 2001 to 2013; age; schooling; race/skin color; operative classification and clinical form of leprosy; and the degree of incapacity at the time of notification and medical discharge.

2.2. Statistical analysis

The data collected were inserted in *Microsoft Excel*© spreadsheets, to be analyzed according to the descriptive statistics of the association measure and the adherence test (*Bioestat* Software 5.0). For the analysis of temporal tendency, the simple polynomial regression model was used, with centralization of the time variable to avoid serial autocorrelation between the equations terms [19]. Therefore, the models Y = ß0 + ß1 (year - 2007), where Y = standardized coefficient; ß0 = average coefficient of the period; ß1 = average annual increment, with 2007 being considered the midpoint of the historical series.

2.3. Ethical statement

The project was developed in accordance with RESOLUTION No. 466, FROM DECEMBER 12th, 2012, from the National Health Council [RESOLUÇÃO Nº 466, DE 12 DE DEZEMBRO DE 2012 – Conselho Nacional de Saúde] and was approved by the Ethics and Research Committee with Humans [Comitê de Ética e Pesquisa com Seres Humanos] (Process No 643.474 from 09/may/2014, registered at PLATAFORMA BRASIL and approved (CAAE 30234214.7.0000.5546).

3. Results

From 2001 to 2013, 3,519 cases of leprosy were detected, distributed in the MRA municipalities as follows: Aracaju, 2,366 (67%); Nossa Senhora do Socorro, 693 (20%); São Cristóvão, 315 (9%); and Barra dos Coqueiros, 145 (4%). The mean annual MRA rate was 3.49 cases per 10,000 inhabitants.The distribution of leprosy cases by gender (Table 1) indicated a slight predominance in females (X^2 = 0.329, p = 0.5665). When analyzed by each MRA municipality, there was a predominance of males in São Cristóvão, Barra dos Coqueiros and Nossa Senhora do Socorro (p> 0.05). In Aracaju, the female gender was predominant (X^2 = 1.897, p = 0.1684).

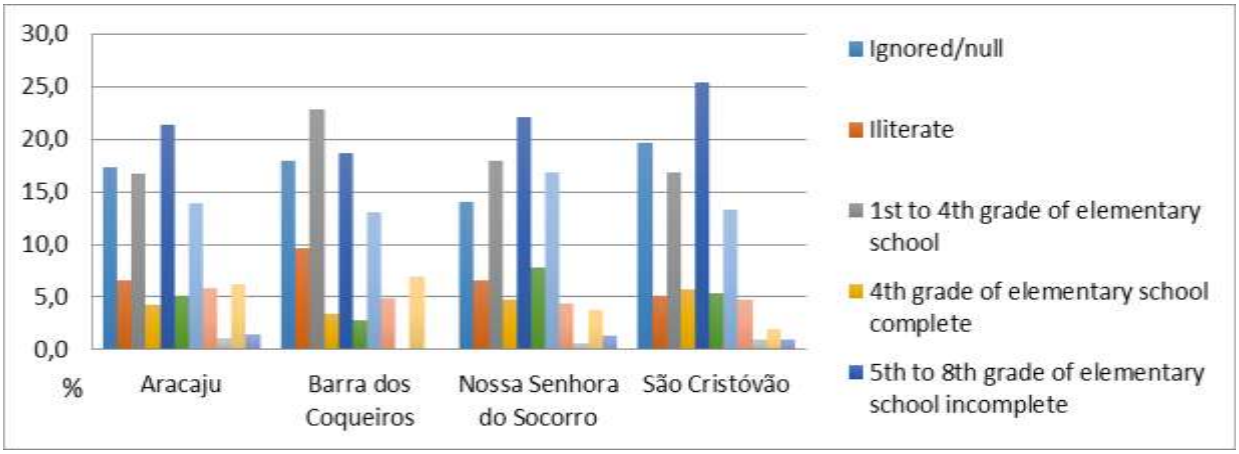
Table 1. Distribution of leprosy cases per gender in the metropolitan region of Aracaju, Sergipe, Brazil (2001-2013).

Municipality	Gender		Total
	Male	Female	
Aracaju	1149	1217	2366
Barra dos Coqueiros	74	71	145
Nossa Senhora do Socorro	357	336	693
São Cristóvão	162	153	315
Total	1742	1777	3519

Source: SINAN data.

Considering schooling, individuals who studied from 5th to 8th grade of elementary school represented the majority of notifications (21.77%; Fig. 1). The adherence test revealed a statistically significant difference in the distribution of this variable ($X^2 = 56.129$, $p < 0.01$).

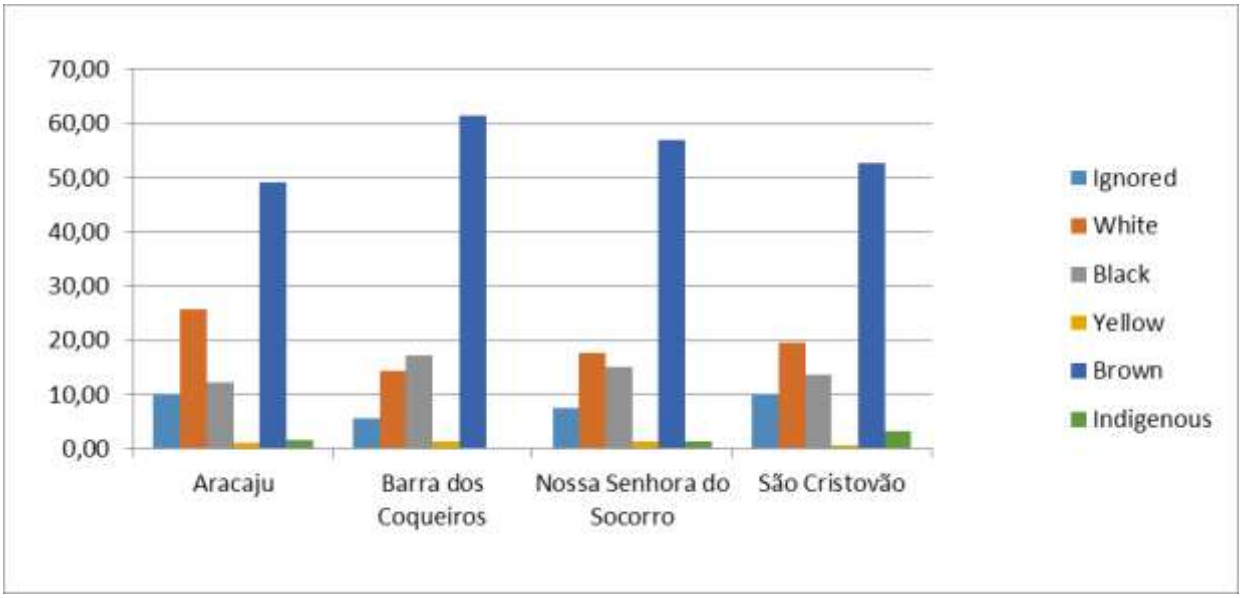
Figure 1. Distribution of leprosy cases according to schooling in the metropolitan region of Aracaju, Sergipe, Brazil (2001-2013).



Source: SINAN data.

Regarding race, a higher frequency of leprosy was found among brown-skinned individuals (51.46%), followed by the number of cases in white (23.22%) and black-skinned (13.19%), respectively (Figure 2).

Figure 2. Distribution of leprosy cases according to race / skin color in the metropolitan region of Aracaju, Sergipe, Brazil (2001-2013).



Source: SINAN data.

According to the operational classification, the paucibacillary form was predominant (52.8%) when compared to the multibacillary (47.1%). Unclassified cases represented 0.1% of notifications. The distribution of operational forms among the MRA municipalities did not have statistical significance (p> 0.05; Table 2).

Table 2. Distribution of leprosy cases regarding operational classification in the metropolitan region of Aracaju, Sergipe, Brazil (2001-2013).

Municipality	Operational Classification						Total
	Paucibacillary		Multibacillary		Ignored		
	n	%	n	%	n	%	n
Aracaju	1312	55.5	1053	44.5	1	0	2366
Barra dos Coqueiros	64	44.1	81	55.9	0	0	145
Nossa Senhora do Socorro	320	46.2	370	53.4	3	0	693
São Cristóvão	161	51.8	154	48.9	0	0	315
Metropolitan Region	1857	52.8	1658	47.1	4	0.1	3519

Source: SINAN data.

The distribution of the clinical forms of leprosy in the MRA had the following frequency: tuberculoid (27.3%), undetermined (21%); virchowian (21%); and dimorph

(19.8%). The distribution analysis of this variable showed that there was no statistically significant difference ($X^2 = 1.432$, $p = 0.698$; Table 3).

Table 3. Distribution of leprosy cases according to clinical form in the metropolitan region of Aracaju, Sergipe, Brazil (2001-2013).

Municipality	Clinical form						Total
	Ignored	Undetermined	Tuberculoid	Dimorph	Virchowian	Unclassified	
Aracaju	54	574	684	463	449	142	2366
Barra dos Coqueiros	1	29	25	33	40	17	145
N. Sra. do Socorro	30	138	171	131	186	37	693
São Cristóvão	3	80	79	69	65	19	315
Total	88	821	959	696	740	215	3519

Source: SINAN data.

The frequency of over 50% in all MRA municipalities, had the following distribution: Aracaju, 59.9%; Barra dos Coqueiros, 58.6%; São Cristóvão, 55.2%; and Nossa Senhora do Socorro, 56.0%. Barra dos Coqueiros was the municipality with the highest number of patients with loss or decreased sensitivity, Grade I disability (23.4% of the cases), and also patients with Grade II disability (8.3% frequency) (Table 4).

Table 4. Cases of leprosy according to the degree of disability, assessed at the time of notification, in the metropolitan region of Aracaju, Sergipe, Brazil (2001-2013).

Degree of disability	Municipality									
	Metropolitan region		Aracaju		Barra dos Coqueiros		N. Sra. do Socorro		São Cristóvão	
	n	%	n	%	n	%	n	%	n	%
Grade 0	2055	58.4	1408	59.5	85	58.6	388	56.0	174	55.2
Grade I	618	17.6	418	17.7	34	23.4	110	15.9	56	17.8
Grade II	213	6.1	134	5.7	12	8.3	43	6.2	24	7.6
Ignored or not evaluated	633	18.0	406	17.2	14	9.7	152	21.9	61	19.4
Total	3519	100	2366	100	145	100	693	100	315	100

Source: SINAN data.

Regarding the age group, leprosy distribution was higher among the 20-59 age groups in all MRA municipalities. The lowest number of diagnoses was found in the population under 1 and over 80 (Table 5).

Table 5. Distribution of leprosy cases in the metropolitan region of Aracaju, Sergipe, Brazil, according to the age group (2001-2013).

Age group	Municipality									
	Metropolitan region		Aracaju		Barra dos Coqueiros		Nossa Sra. do Socorro		São Cristóvão	
	n	%	n	%	n	%	n	%	n	%
< 1	2	0.1	0	0	0	0	2	0.3	0	0
1-4	13	0.4	9	0.4	0	0	2	0.3	2	0.6
5-9	81	2.3	56	2.4	3	2.1	13	1.9	9	2.9
10-14	171	4.9	101	4.3	8	5.5	42	6.1	20	6.3
15-19	237	6.7	146	6.2	12	8.3	54	7.8	25	7.9
20-39	1395	39.7	918	38.8	51	35.2	282	40.7	144	45.7
40-59	1048	29.8	711	30.1	42	29.0	218	31.5	77	24.4
60-64	199	5.7	140	5.9	8	5.5	41	5.9	10	3.2
65-69	141	4.0	114	4.8	5	4.4	14	2.0	8	2.5
70-79	171	4.9	129	5.5	13	9.0	16	2.3	13	4.1
80+	60	1.7	41	1.7	3	2.1	9	1.3	7	2.2
Total	3158	100	2365	100	145	100	693	100	315	100

Source: SINAN data.

The healing outcome of leprosy had a frequency greater than 60% in all MRA municipalities. Transfers were less than 10%, deaths less than 2% and less than 5% of the patients detected abandoned the treatment (Table 6).

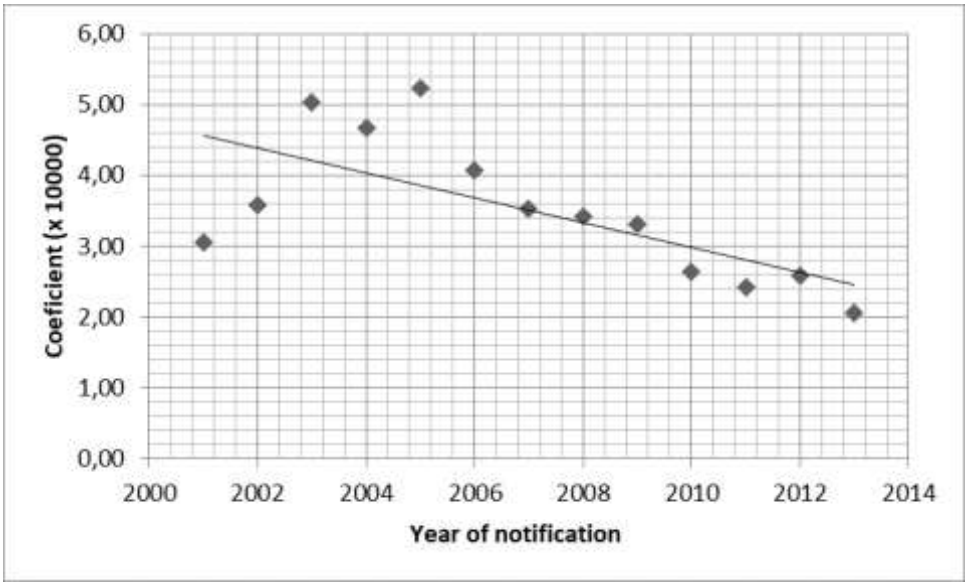
Table 6. The outcome of leprosy cases in the metropolitan region of Aracaju, Sergipe, Brazil (2001-2013).

Outcome	Municipality									
	Metropolitan region		Aracaju		Barra dos Coqueiros		N. Sra. do Socorro		São Cristóvão	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Healing	2798	79.51	1976	83.5	115	79.3	475	68.5	232	73.7
Transfers	242	6.88	86	3.6	11	7.6	100	14.4	45	14.3
Death	34	0.97	24	1.0	2	1.4	5	0.7	3	1.0
Abandonment	89	2.53	59	2.5	2	1.4	26	3.8	2	0.6
Ignored	356	10.12	221	9.3	15	10.3	87	12.6	33	10.5
Total	3519	100	2366	100	145	100	693	100	315	100

Source: SINAN data.

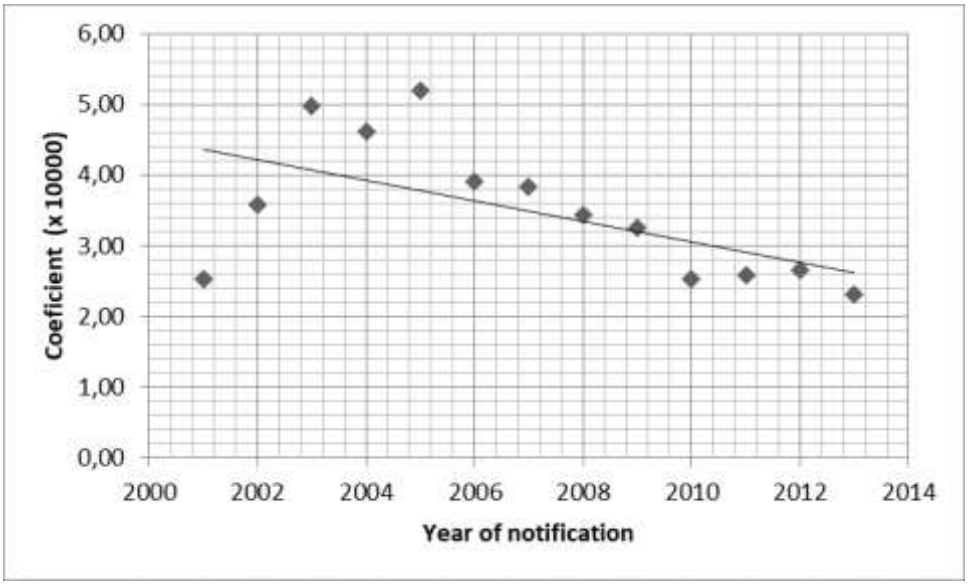
The temporal analysis of the 3,519 leprosy cases detected had a statistically significant ($p < 0.05$) tendency of disease decline in Aracaju (Figure 3), as well as in all MRA municipalities (Figure 4).

Figure 3. Temporal analysis of leprosy in Aracaju, Sergipe, Brazil (2001-2013), with $y = 3.5069 – 0.1760x$; $p = 0.01$.



Source: SINAN data.

Figure 4. Analysis of leprosy in the metropolitan region of Aracaju, Sergipe, Brazil (2001-2013) with y = 3.4885 - 0,1440; p= 0,0393.



Source: SINAN data.

4. Discussion

Of the 3,519 reported leprosy cases in the MRA, 2,366 (67%) were in Aracaju, the municipality with the largest population among the MRA municipalities, with a predominance of the paucibacillary form in all municipalities in the region.

The prevalence of leprosy in the male gender has been reported (BRASIL, 2020). For some authors, this occurrence could be related to the fact that men are more exposed to the disease (DATASUS, 2019; Santos et al., 2013). However, there was a slight predominance of the disease in the female sexin Aracaju, different to the observed in the other MRA municipalities, where the disease predominated among male individuals.

In the present study, the detection rate of leprosy was high among elementary school students and very low among the upper-level ones. Individuals attending elementary school II (5th to 8th grade) accounted most of the notifications. For Magalhães et al., 2011, Moreira et al., 2008, Moura et al., 2013 and Ridéey & Jopling, 1966, access to information on leprosy clinical signs and symptoms helps in the prevention and cure of the disease (Magalhães et al., 2011; Moreira et al., 2008; Moura et al., 2013; Ridéey & Jopling, 1966). Meanwhile, among illiterates, lack of information may be hampering the access to health services, health promotion and disease prevention. According to Aquino, Caldas, Silva, & Costa, 2003 and Latorre, 2001, educational campaigns and active search in schools have provided the

population with a better knowledge about leprosy and influenced in detecting new cases in the initial form of the disease (Aquino, Caldas, Silva, & Costa, 2003; Latorre, 2001)

No data were found relating race/skin color to the occurrence of leprosy. In Sergipe, brown-skinned individuals represent 61.39% of the population (Lima, Sauaia, Costa, Coelho Neto, & Figueiredo, 2010). In our study, 51.46% of brown-skinned individuals in the MRA were leprosy patients, a finding possibly related to the existence of a larger number of this race in the population of the analyzed region (Latorre, 2001; Montenegro et al., 2004).

Regarding the predominance of the paucibacillary form, it may be related to the early diagnosis in the health units and the active search in schools and community. This did not appear to have occurred in Barra dos Coqueiros (55.9%) and Nossa Senhora do Socorro (53.4%), municipalities with a predominance of the multibacillary form. This finding was similar to those described by Lastória & Abreu, 2014 (Lastória & Abreu, 2014). These results seem to indicate the importance of a greater integration of leprosy control actions for those municipalities, providing better information and health education for this population.

The tuberculoid form was the most frequent in the MRA (27.3%), followed by the Virchowian form (21%), which was more frequent in the municipalities of Barra dos Coqueiros (27.6%) and Nossa Senhora do Socorro (26.8%). These findings corroborate with that reported by the Ministry of Health (2008).

While some authors emphasize the importance of periodic evaluations, during or after treatment (Finez & Salotti, 2011; Pimentel et al., 2003), in the present study it was observed that 50% of the patients were not evaluated at medical discharge. It is important to emphasize that the degree of incapacity is related to the disease evolution; for this reason it is necessary an effort to make an early diagnosis as a measure to prevent sequelae and complications of leprosy.

The prevalence of leprosy cases detected in individuals in the 20-59 age group, in all MRA municipalities, along with patients younger than 19, may suggest the occurrence of contagion in the first years of life. This fact causes an increase in the number of leprosy disseminators, since this population is in contact with a large number of young people, especially in schools (Grossi, 2009; IBGE, 2019). According to some authors, this may justify the adoption of prevention and diagnostic measures aimed at this age group, such as campaigns and lectures in schools, identifying symptoms and signs of leprosy, with active search in domiciles and schools (Araújo, Lana, Fonseca, & Lanza, 2004; Lana et al., 2007; Magalhães et al., 2011; Ridéey & Jopling, 1966).

There was a high percentage of cure, especially in the municipalities of Aracaju (79.51%) and Nossa Senhora do Socorro (68.5%). Despite these indicators, authors emphasize the need to intensify diagnostic and preventive strategies, as well as the patients' awareness of how important the nointerruption of the transmission chain, not abandoning treatment (Montenegro et al., 2004; Opromolla & Laurenti, 2011; PAHO, 2019; Pereira et al., 2008; Sampaio et al., 2013; Talhari et al., 2012; WHO, 2011).

The temporal analysis of leprosy in the MRA identified a tendency for the disease to decline, with the best results being found in Aracaju. The result may be related to a greater number of health facilities (postos de saúde) and better access of to health programs, either through active search or stimulated demand.

5. Conclusion

Despite the fact that the majority of patients had a disability grade 0, the number of patients with some type of disability at diagnosis (1,176 cases) and the high number of cases with an undetermined clinical form (821 cases), demonstrate that there is a high bacillary load circulating in the community, and there are probably difficulties in the basic health network in early diagnosis of leprosy cases in the region.

High rates of individuals with leprosy in the 10-14 and 15-19 years old age groups indicate the necessity for greater attention by public health agencies, mainly due to the disabilities and deformations that the disease can cause, with harmful effects on the self-esteem of these young individuals.

The temporal analysis demonstrated that there is a tendency for the decline of new cases detected in the Metropolitan Region of Aracaju. However, 3,519 cases of leprosy detected during the study period remain high. Based on these results, a better study is needed regarding the attendance of the Health Programs and the population access to these services, since the strategies of the Ministry of Health during the study period (2001-2013) were not effective in achieving the WHO goal for the disease elimination.

It is of the utmost importance that the research and control activities of leprosy be maintained and developed for the purpose of its elimination and effective control. Promotional, preventive and curative actions should be identified and put into practice, in an attempt to improve the epidemiological scenario of leprosy in the Metropolitan Region of Aracaju.

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