Epidemiological profile and tendency of leprosy in people younger than 15 years

Perfil epidemiológico e tendência da hanseníase em menores de 15 anos

Perfil epidemiológico y tendencia de la lepra en los menores de 15 años

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ABSTRACT

Objective: To evaluate the epidemiological characteristics and tendency of new leprosy cases in people younger than 15 years in the state of Bahia, Brazil, between 2007 and 2017. **Method:** Quantitative, cross-sectional, descriptive study of cases registered in the Notifiable Diseases Information System. The sociodemographic variables were statistically analyzed through the G-test and trend classification was analyzed through linear regression, along with the tendency or percentage change. **Results:** The study comprised 2,298 new cases and presented decreasing rate of detection, growing proportion of investigated contacts, and decreasing proportion of healing. Paucibacillary cases are emphasized, with a 63.27% proportion and predominance among females with incomplete primary education and brown race/color living in urban zones. Regarding clinical forms, physical disabilities, and modes of detection, 26.68% were tuberculoid, 73.72% were grade zero, and 36.42% were referral, respectively. **Conclusion:** The increased tendency in the proportion of investigated contacts and the decrease in the proportion of healing revealed a need for the health system to improve patient follow-up during treatment against leprosy.

DESCRIPTORS

Leprosy; Disease Notification; Epidemiology; Public Health Nursing.

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INTRODUCTION

Leprosy is caused by *Mycobacterium leprae*, a gram-positive bacillus which is highly resistant to acid alcohol. It has been described as an infectious chronic and granulomatous disease which can injure nerves and skin[1-2] while leading to blindness and even loss of limbs[3].

This bacillus is transmitted mainly via the upper respiratory tract and its primordial attraction of invasion are Schwann cells, located in the Peripheral Nervous System (PNS). This invasion may lead to diverse forms of clinical presentation, which are classified according to the immune response of each host[4].

As a major public health issue, leprosy has a long incubation period, which may last for up to ten years. Consequently, detection of this disease is easier during adulthood, showing that the infection of people younger than 15 years may be due to the persistence of the bacillus in the hosts or of their early exposition to *Mycobacterium leprae*, revealing thus abnormal figures of this disease in the studied region[5].

In 2016, around 214,783 new cases of leprosy were detected worldwide. Southeast Asia presented the highest index, with 8.2 cases per 100,000 citizens, followed by the American continent, with 2.7 cases per 100,000 citizens, Africa, with 2.0, Eastern Mediterranean, with 0.4, Western Pacific, with 0.2, and Europe, with only 32 new cases[6].

In 2016, the number of new cases in Brazil was 25,218, a figure responsible for placing it second among countries presenting more cases that year, losing only to India. Indonesia, Democratic Republic of Congo, Nepal, and Bangladesh are, respectively, the countries which were below Brazil in number of new cases of leprosy[6].

In relation to the number of new cases in 2015 in people younger than 15 years, the Brazilian North was the most remarkable region, with around 2.29 cases per 100,000 citizens, followed by the Northeast region, with 1.96 cases, Center-West, with 1.91, Southeast, with 0.17, and South, with 0.07[7].

The present study had thus the objective of determining the epidemiological profile and tendency of new cases of leprosy in people younger than 15 years in the state of Bahia from 2007 to 2017.

METHOD

DESIGN OF STUDY

This is a quantitative, cross-sectional, descriptive study of new cases of leprosy in people younger than 15 years in the state of Bahia, Brazil, between 2007 and 2017.

SCENARIO

The state of Bahia is estimated to have 15,344,447 citizens[8] and includes 417 municipalities. In addition to being considered the fourth most populous Brazilian state, Bahia is also classified as the fifth largest in territory and most of its population lives in urban areas[9].

SELECTION CRITERIA

All new cases of leprosy in people younger than 15 years between 2007 and 2017 were included in this study, except for cases of misdiagnosis, transference to another country, transference to another state, and diagnosis date prior to 2007.

DATA COLLECTION

Research data was collected from the Notifiable Diseases Information System (*Sistema de Informação de Agravos de Notificação* – SINAN), provided by the Epidemiological surveillance of Bahia state's Health Office.

For exploring and characterizing the data, the following variables have been analyzed: the leprosy detection rate in people younger than 15 years, proportion of investigated household contacts among the registers of new cases of leprosy, and the proportion of healing of new disease cases. Among the sociodemographic data, the following were analyzed: gender, education, race/color, and residential area. Clinical form, physical disabilities, and mode of detection of new leprosy cases in people younger than 15 were also analyzed.

Detection rate was calculated with the number of new leprosy cases in people younger than 15 years in the numerator and, in the denominator, the total population younger than 15 multiplied by 100 thousand. The rate was considered hyperendemic if the result was over 10 cases per 100,000 citizens, very high if between 5.00 and 9.99, high if between 2.50 and 4.99, average if between 0.50, and 2.49 and low if lower than 0.50[10].

The proportion of investigated contacts in relation to new cases of leprosy was calculated by dividing the number of household contacts by the number of registered contacts multiplied by 100. The result was considered good if higher than 75%, average between 50 and 74.9%, and precarious if smaller than 50%. The proportion of healing had as its numerator the amount of new cured cases, which was divided by the total of new cases multiplied by 100. The result was considered good if higher than 90%, average if between 75 and 89.9%, and precarious if smaller than 75%[10].

DATA ANALYSIS AND TREATMENT

For tabulating data and elaborating graphics and tables, software Microsoft Excel® 2013 was employed and, for statistical analysis, software BioEstat 5.3, in which the G-test for the sociodemographic variables and linear regression for the graphics were used. The whole study was conducted with a significance level of 5% ($p < 0.05$).

For the classification of trends in each graphic, the linear regression model was employed with the formula $Y = b_0 + b_1 x$, in which b_0 refers to the intersection between the line and the vertical axis, whereas b_1 denotes line inclination. To reduce the latter's alternate index, logarithmic changes were implemented in the values of Y, exposing thus decrease in the heterogeneity of the residual variance. The value of X was established according to the time of each analysis[11].

The annual percent change (APC) was also calculated, through the formula APC = [−1+10^{b1}] *100% and 95% (IC95%=[−1+10b1^{min}.] *100%; [−1+10b1^{max}.] *100%). The tendency was considered as growing when the rate was positive, decreasing when negative and stationary when presenting no significant value between its result and zero[11].
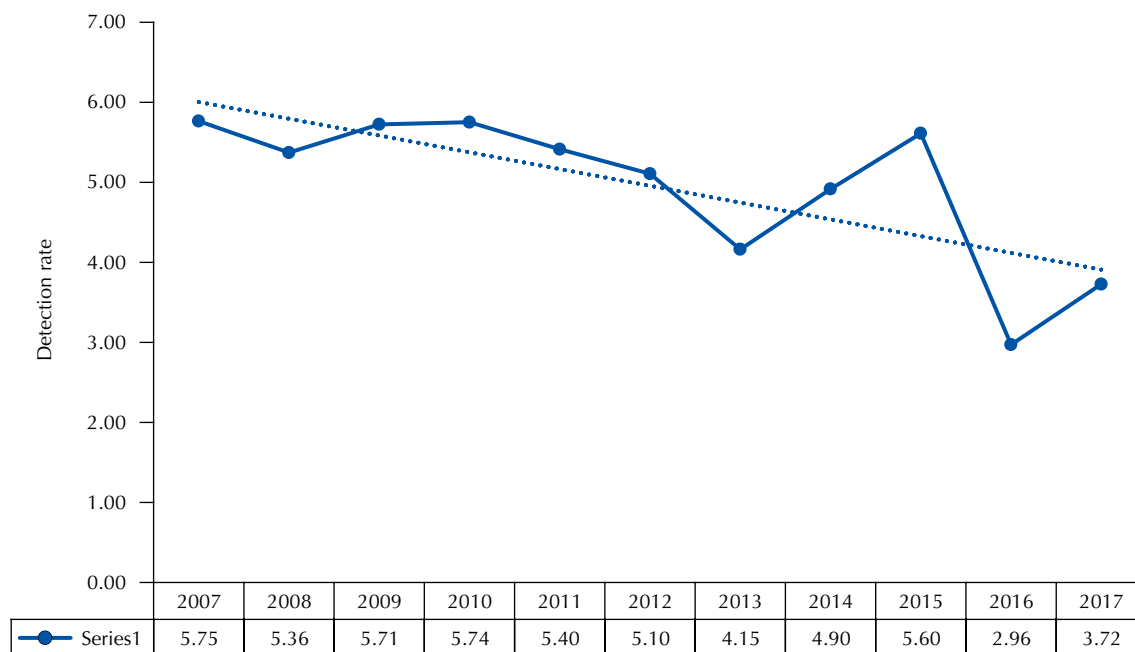
ETHICAL ASPECTS

Since this research involved consultation to a secondary database, it was exempt of submission to a Research Ethics Committee. However, all the precautions emphasized in Resolution n. 466, from December 12, 2012, by the National Health Council, were abided by[12].

RESULTS

In the study's timeframe, 2,298 new leprosy cases in people younger than 15 years were analyzed. The detection rate of this disease (Figure 1) presented a decreasing trend and an APC of -2.797 (CI95% -4.571; -0.623).

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Series1	5.75	5.36	5.71	5.74	5.40	5.10	4.15	4.90	5.60	2.96	3.72

Source: SINAN.

Figure 1 – Detection rate of new cases of leprosy in people younger than 15 years in Bahia, Brazil, per 100,000 citizens, 2007-2017.

Regarding sociodemographic characteristics, for statistical purposes, the cases were separated according to clinical operational classification into Paucibacillary and Multibacillary. Out of the 2,298 new cases, 63.27% corresponded to the operational paucibacillary classification.

Regarding the predominance of new cases and the percentage of paucibacillary cases, factors emphasized are, respectively, female gender, with 53.16%, incomplete primary education, with 66.02%, brown, with 63.34%, and urban zone, with 77.79% (Table 1).

Table 1 – Sociodemographic characteristics of new cases of leprosy in people younger than 15 years, according to operational classification – Bahia, Brazil, 2007-2017.

Variable	Paucibacillary		Multibacillary		P
	N	%	N	%	
Gender					< 0.0001*
Male	681	46.84	469	55.57	
Female	773	53.16	375	44.43	
Education					0.0254*
Illiterate	5	0.34	7	0.83	

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Variable	Paucibacillary		Multibacillary		P
	N	%	N	%	
Incomplete primary education	960	66.02	601	71.21	
Complete primary education	21	1.44	12	1.42	
Incomplete secondary education	22	1.51	17	2.01	
Complete secondary education	4	0.28	3	0.36	
Ignored/Blank**	442	30.40	204	24.17	
Race/color					0.1636*
White	211	14.51	98	11.61	
Black	218	14.99	143	19.94	
Asian	15	1.03	10	1.18	
Brown	921	63.34	543	64.34	
Indigenous	6	0.41	8	0.95	
Ignored/Blank**	83	5.71	42	4.98	
Residential area					0.184*
Urban	1131	77.79	633	75	
Rural	244	16.78	162	19.19	
Peri-urban	6	0.41	8	0.95	
Ignored/Blank**	73	5.02	41	4.86	

Source: SINAN.
*G-test.
**Not included in the statistical analysis.

Concerning clinical form, physical disability, and mode of detection, the most remarkable results were, respectively, 26.68% for tuberculoid, 73.72% for grade 0, and 36.42% for referral (Table 2).

Table 2 – Classification of newly notified cases of leprosy in people younger than 15 years per clinical form, physical disability, and mode of detection in Bahia, Brazil, 2007-2017.

Clinical Form	N	%
Unspecified	599	26.07
Tuberculoid	613	26.68
Dimorphous	541	23.54
Virchowian	132	5.74
Ignored/Blank	413	17.97
Physical disability	N	%
Grade 0	1694	73.72
Grade 1	239	10.40
Grade 2	52	2.26
Ignored/Blank	313	13.62
Detection mode	N	%
Referral	837	36.42
Spontaneous Demand	670	29.16
Collective exam	135	5.87
Contact investigation	423	18.41
Other modes	32	1.39
Ignored/Blank	201	8.75

Source: SINAN.

The proportion of investigated contacts has presented an increasing trend, with an APC of 0.124 (CI95% -0.071; 0.320). According to the data, 2014 was the only year to register a percentage considered as good, with 80.92%, differently from the years 2007, 2008, and 2017, which registered precarious conditions, with less than 50% (Figure 2).
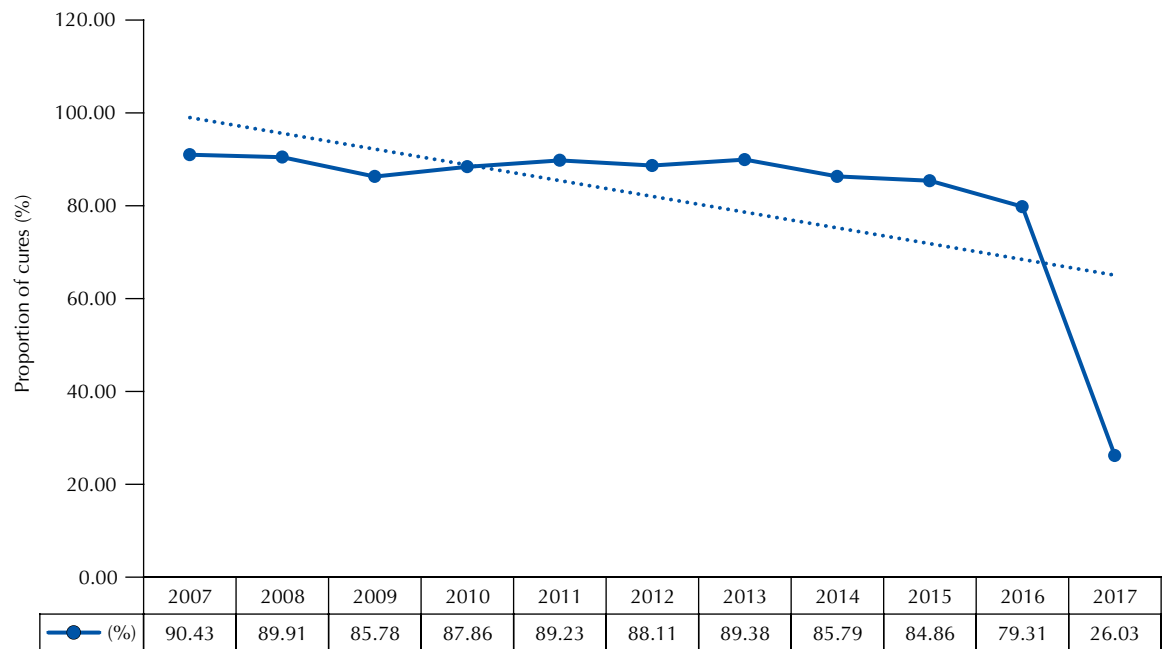

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
(%)	48.38	46.69	59.41	66.45	65.60	61.41	74.21	80.92	69.38	72.45	47.47
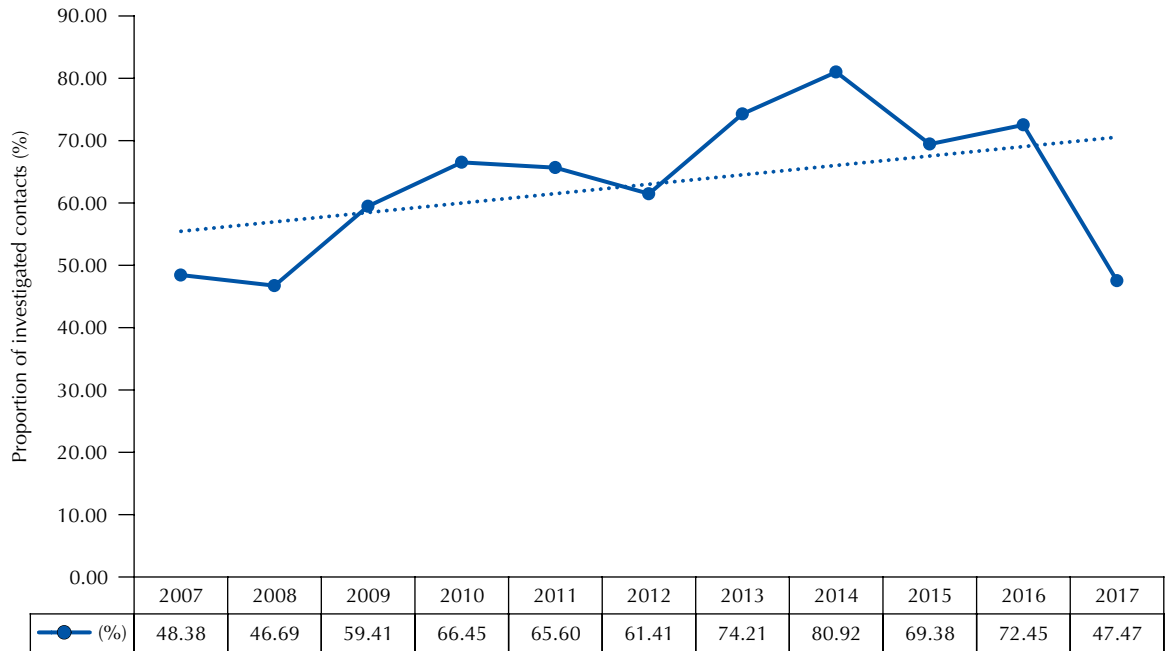
Source: SINAN.

Figure 2 – Proportion of investigated contacts per new cases of leprosy in people younger than 15 years in Bahia, Brazil, 2007-2017.

Regarding the proportion of cures, temporal analysis has shown a decreasing trend, with an APC of -0.107 (CI95% -0.214; 0.001), whose values were considered average. However, the year 2017 presented a precarious situation, with only 26.03% of cure (Figure 3).

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
(%)	90.43	89.91	85.78	87.86	89.23	88.11	89.38	85.79	84.86	79.31	26.03

Source: SINAN.

Figure 3 – Proportion of cured new cases of leprosy in people younger than 15 in Bahia, Brazil, 2007-2017.

DISCUSSION

Results show that Bahia, the state of Tocantins and Brazil itself[13-14] presented decreasing trends of the leprosy detection rate in people younger than 15 years. Treatment measures such as immunoprophylaxis, polychemotherapy (PQT) and the coverage of the health system are factors which contributed to such results[14]. However, despite this setback, the detection coefficient was still high in the year 2017, with 3.72 cases by 100.000 citizens[10].

Such reduction also suggests possible underreporting, since this situation is frequent due to difficulties in diagnosis, professional neglect, or precarious structures in the care units. This situation mostly impacts on actions developed through notifications, such as data reliability and measures of prevention and epidemiological control of some diseases[15].

Regarding the operational classification, paucibacillary cases were predominant, indicating an excessive exposition of hosts to the bacillus and thus suggesting an uncontrolled endemic situation and active disease transmission, to the point of infecting children[16]. Other studies have also revealed this predominance, such as a study conducted in Ceará state and another one in Uttar Pradesh, India[16-17].

Regarding the gender variable, females were observed to present the highest rates of the research, corroborating thus other analyses available in the literature, such as a study conducted previously in Bahia state and another one in its capital[18-19]. Much of the literature also reports that men present the highest rates of new leprosy cases, which is often due to their higher exposition to *Mycobacterium leprae* and lesser care concerning their own health[20].

Incomplete primary education presented the highest rates in the analysis, considering that most people younger than 15 years are still in this educational phase[21]. Such result is similar to that of a study conducted in Santarém, Pará state, and another one in Igarapé-Açu, also in Pará[22-23].

Concerning the variable race/color, it is should be noted that, due to colonization and miscegenation in Brazil, the brown color prevailed in the study[24], a fact which is also present in other studies, such as an analysis conducted in Imperatriz, Maranhão state, and another one in the state of Mato Grosso, Brazil[25-26].

Concerning residential areas, the present result is associated to that of a study conducted in Ceará, in which urban populations have an housing index much higher than those of non-urban areas[27].

In relation to clinical form, tuberculoid is noted to present the highest rates, which suggests that individuals have a strong immunity against *Mycobacterium leprae*. However, these may be a source of parasite transmission, which requires more searches and contact investigation, since possible infections may follow and, if treatment is performed in the initial phase, other occurrences may be avoided[19]. A similar result has been found for the city of Salvador, in Bahia, and in Imperatriz, in the state of Maranhão[19,25].

Regarding the degree of physical disability, this finding is parallel to that of a study conducted in Goiânia, Goiás state, and another one in a municipality in inland Pará[23,28]. Due to the fact that the analysis is directed only at people younger than 15 years, this follows from the short period of time of this disease, since its duration is one of the factors that contribute to the development of a degree of physical disability in the host, showing thus an early detection of leprosy[28].

Detection mode may be either passive or active. Passive form refers to detections performed when an individual seeks for service in the health system[28]. This includes, not exhaustively, referrals, which prevailed both in the present research and in these studies[16,23]. The active form takes place when the opposite happens, i.e., the health system searches for new cases, as in contact investigation[28].

The found proportion of examined contacts was coherent with a study conducted in Juazeiro, Bahia[29]. This ratio is useful for evaluating the capacity of the surveillance service regarding household contacts to promote detection of new cases and immediate treatment[10]. Therefore, considering the increasing tendency, the surveillance service is understood to have improved, since this reduction can only occur when there is an increase in the number of examined contacts[26].

The proportion of cures had a declining trend, according to a study conducted in Teresina, Piauí state[30]. Such reduction may result from an inability in maintaining quality of treatment until the patient is cured or flaws during its follow-up until discharge[26].

The year 2017, in comparison with others, presented a sharp regression over the epidemiological indexes, in agreement both with the proportion of investigated contacts and the proportion of cures. Such a condition is believed to be possibly related to neglect or major difficulties by the health system that year. A reduction in the performance of contact investigation, a worse quality of treatment for people who have the disease, or even flaws by the epidemiological surveillance service may have been factors bearing influence on this setting[15].

CONCLUSION

Leprosy in Bahia in the studied timespan presented a decreasing detection rate, and an increasing proportion in investigated contacts, showing thus an improvement by the surveillance service team. However, a decrease in the proportion of cures was noted, showing thus the need for the health system to improve follow-up of patients when treating leprosy. The high number of paucibacillary cases, zero degree of physical disability, and referral as a mode of detection are noted.

A small percentage of people who were ignored regarding the analyzed variables was also observed, suggesting thus difficulties by health professionals in conducting clinical classification and identifying physical disability regarding this disease. The importance of conducting more research on this theme is therefore emphasized, since research on the topic may be a vehicle for creating governmental measures to help fighting leprosy.

RESUMO

Objetivo: Avaliar as características epidemiológicas e tendência dos casos novos de hanseníase em menores de 15 anos no estado da Bahia, no Brasil, entre 2007 e 2017. **Método:** Análise quantitativa, transversal e descritiva dos casos registrados no Sistema de Informação de Agravo de Notificação. As variáveis sociodemográficas foram analisadas estatisticamente por meio do teste G, e a classificação das tendências, por meio da regressão linear, juntamente com a tendência ou mudança percentual. **Resultados:** Constituído por 2.298 casos novos, o estudo apresentou taxa de detecção decrescente, proporção de contatos examinados crescente e proporção de cura decrescente. Os casos Paucibacilares se destacaram, com 63,27%, predominando entre pessoas do sexo feminino, com ensino fundamental incompleto, raça/cor parda e com zona de residência urbana. Quanto a forma clínica, incapacidade física e modo de detecção, 26,68% foram tuberculoide, 73,72%, grau 0 e 36,42%, encaminhamento, respectivamente. **Conclusão:** A tendência aumentada na proporção de contatos examinados e a diminuição na proporção de cura revelaram uma necessidade de melhoramento por parte do sistema de saúde no acompanhamento dos pacientes durante o tratamento contra a hanseníase.

DESCRITORES

Hanseníase; Notificação de Doenças; Epidemiologia; Enfermagem em Saúde Pública.

RESUMEN

Objetivo: Evaluar las características y tendencias epidemiológicas de los nuevos casos de lepra en los menores de 15 años en el Estado de Bahia (Brasil) entre 2007 y 2017. **Método:** Estudio cuantitativo, transversal y descriptivo de los casos registrados en el Sistema de Información de Agravamientos de Notificación (Sistema de Informação de Agravo de Notificação). Las variables sociodemográficas se analizaron estadísticamente mediante la prueba G y las tendencias se clasificaron mediante una regresión lineal, junto con la tendencia o el cambio porcentual. **Resultados:** Con 2.298 nuevos casos, el estudio mostró una disminución de la tasa de detección, un aumento de la proporción de contactos examinados y una disminución de la proporción de curaciones. Se destacaron los casos paucibacilares, con un 63,27%, predominando en el sexo femenino, con educación primaria incompleta, raza/color pardo y con zona de residencia urbana. En cuanto a la forma clínica, la discapacidad física y el modo de detección, el 26,68% eran tuberculoides, el 73,72%, grado 0 y el 36,42%, de referencia, respectivamente. **Conclusión:** El aumento de la tendencia en el porcentaje de contactos examinados y la disminución de la proporción de curaciones reveló la necesidad de que el sistema de salud mejore el seguimiento de los pacientes durante el tratamiento contra la lepra.

DESCRIPTORES

Lepra; Notificación de Enfermedades; Epidemiología; Enfermería en Salud Pública.

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