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Tuberculosis and latent tuberculosis in prison inmates

Tuberculose e tuberculose latente na população prisional

ABSTRACT

OBJECTIVE: To estimate the prevalences of tuberculosis and latent tuberculosis in inmates.

METHODS: Observational study was carried out with inmates of a prison and a jail in the State of São Paulo, Southeastern Brazil, between March and December of 2008. Questionnaires were used to collect sociodemographic and epidemiological data. Tuberculin skin testing was administered (PPD-RT23-2TU/0.1 mL), and the following laboratory tests were also performed: sputum smear examination, sputum culture, identification of strains isolated and drug susceptibility testing. The variables were compared using Pearson's chi-square (χ^2) association test, Fisher's exact test and the proportion test.

RESULTS: Of the 2,435 inmates interviewed, 2,237 (91.9%) agreed to submit to tuberculin skin testing and of these, 73.0% had positive reactions. The prevalence of tuberculosis was 830.6 per 100,000 inmates. The coefficients of prevalence were 1,029.5/100,000 for inmates of the prison and 525.7/100,000 for inmates of the jail. The sociodemographic characteristics of the inmates in the two groups studied were similar; most of the inmates were young and single with little schooling. The epidemiological characteristics differed between the prison units, with the number of previous tuberculosis and of previous contact with the disease greater in the prison and coughing, expectoration and smoking more common in the jail. Among the 20 *Mycobacterium tuberculosis* strains identified, 95.0% were sensitive to anti-tuberculosis drugs, and 5.0% were resistant to streptomycin.

CONCLUSIONS: The prevalences of tuberculosis and latent tuberculosis were higher in the incarcerated population than in the general population, and they were also higher in the prison than in the jail.

DESCRIPTORS: Latent Tuberculosis. Epidemiology. Prisoners. *Mycobacterium tuberculosis*. Microbial Sensitivity Tests. Tuberculin Skin Test.

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RESUMO

OBJETIVO: Estimar a prevalência da tuberculose e tuberculose latente em detentos.

MÉTODOS: Estudo observacional foi realizado com detentos de uma penitenciária e de um centro de detenção provisória do Estado de São Paulo, SP, entre março e dezembro de 2008. Questionários foram utilizados para a coleta de dados sociodemográficos e epidemiológicos. O teste tuberculínico foi aplicado (PPD-RT23-2UT/0,1ml) e os seguintes exames laboratoriais foram realizados: baciloscopia de escarro, cultura de escarro, identificação das cepas isoladas e teste de sensibilidade às drogas antituberculose. As variáveis foram comparadas utilizando-se o teste de associação qui-quadrado de Person (χ^2), teste exato de Fisher e teste das proporções.

RESULTADOS: Dos 2.435 detentos entrevistados, 2.237 (91,9%) concordaram em submeter-se ao teste tuberculínico e destes, 73,0% foram reatores. O coeficiente de prevalência da tuberculose foi de 830,6 por 100.000 detentos. Os coeficientes de prevalência foram de 1.029,5/100.000 detentos na penitenciária e de 525,7/100.000 detentos no centro de detenção provisória. As características sociodemográficas dos detentos nos dois grupos estudados foram semelhantes; a maioria dos detentos era jovem e solteiro com baixa escolaridade. As características epidemiológicas diferiram entre as unidades prisionais com o número de casos de tuberculose no passado e de contato prévio com doente maior na penitenciária e tosse, expectoração e hábito de fumar mais comum no centro de detenção. Entre as 20 cepas de *Mycobacterium tuberculosis* identificadas, 95,0% foram sensíveis às drogas antituberculose e 5,0% foram resistentes à estreptomicina.

CONCLUSÕES: As prevalências da tuberculose e da tuberculose latente foram maiores na população carcerária do que na população geral; e também maiores na penitenciária do que no centro de detenção provisória.

DESCRITORES: Tuberculose Latente. Epidemiologia. Prisioneiros. *Mycobacterium tuberculosis*. Testes de sensibilidade microbiana. Teste tuberculínico.

INTRODUCTION

Tuberculosis (TB) is a serious health problem for confined groups, especially with imprisoned populations.^{4,14,15} Studies have shown higher prevalences and incidences of TB in prison populations than in the general populations of various parts of the world since 1944.^{14,15,a,b}

Among the factors that contribute to the high, endemic level of TB in prison populations are the characteristics of these populations. Prisoners typically are young, have little schooling, come from underprivileged communities and have higher than average incidences of HIV infection and recidivists (previous imprisonment).^{8,a,b}

Prisoners experience a higher risk of infection and death from TB because of the following factors: overcrowding, poorly ventilated cells with little sunlight, poor hygienic conditions, inadequate nutrition, and frequent exposure to *Mycobacterium tuberculosis* in a confined space.^{8,a,b}

Prison staff and visitors also have a high risk of contracting TB. Further more, when prisoners are released, the disease becomes a potential problem for the community into which they are reintegrated.^b

In 2008, the prison population of the State of São Paulo, Southeastern Brazil, was about 153,000 persons, distributed across 143 prisons. The prevalence of TB

^a Ministério da Saúde. Secretaria de Vigilância em Saúde. Manual de recomendações para o controle da tuberculose no Brasil. Brasília; 2010.

^b Secretaria de Estado da Saúde. Coordenação dos Institutos de Pesquisa. Centro de Vigilância Epidemiológica "Prof. Alexandre Vranjac". Divisão de Tuberculose e outras Pneumopatias: recomendações para o controle da tuberculose nas prisões. São Paulo; 1999.

was approximately 800 cases per 100,000 inmates, which is higher than the 39.1 cases per 100,000 inhabitants in the general population.^{13,c,d}

Previous studies on TB in the prisons of São Paulo have been conducted by Niero,^e Ferreira et al,⁷ Rozman,^f Oliveira & Cardoso¹¹ and Abrahão et al.¹

Obstacles that have hindered the implementation of control strategies in prisons include the following: prisoners hide their symptoms because of the violent nature of prison life and the need of physical strength for survival, prisoners risk stigmatization and segregation if they report their symptoms, the human and financial resources in prisons are limited, and the health services available in prisons are inadequate.^a

The varying degrees of danger posed by prisoners and the priority given by prison authorities to security at the expense of health have hindered health professionals' access to prisoners. The police fear that inmates will use health professionals as hostages to undertake a mass escape. Changes to the prison routine also require enhanced security. Therefore, infectious cases are rarely diagnosed, and if they are, the lack of control or the interruption of treatment increase the likelihood that drug-resistant strains will develop.^{a,b}

Initial infection with *M. tuberculosis* leads to the development of primary tuberculosis, which in most people is clinically "silent" and resolves without intervention. However, the infection may enter a latent or dormant state, called latent tuberculosis infection (LTBI), which can last for years or even decades.⁶

Approximately 5% of infected persons cannot prevent the multiplication of the bacilli and fall ill within two years after the primary infection. Another 5%, although they successfully block the infection at this stage, become sick later as a result of the reactivation of the original bacilli or as a result of exposure to a new source of infection.^a

Because of the high prevalence of LTBI in Brazilian prisons (65%),^a prisoners are at high risk for TB.^g This disease in closed institutions, because of the potential for transmission and the characteristics of the prison population, should be a high priority for the government.

This study aimed to estimate the prevalence of tuberculosis and latent tuberculosis in inmates of one prison and one jail.

METHODS

Observational study was realized in 2,435 inmates in one prison and one jail in the city of Guarulhos, Southeastern Brazil, from March to December 2008.

The prison housed inmates whose cases had already been judged and who were serving their sentences in closed or semi-open confinement. Built to accommodate 804 prisoners in seclusion and 216 in semi-seclusion, the prison housed 1,194 and 298 prisoners, respectively.

The jail was used for prisoners who were awaiting judgment and those who had already been sentenced but who were awaiting a vacancy in prison. Planned to hold 768 prisoners, the jail housed 1,136.

A research team consisting of doctors, nurses, pharmaceutical chemists, technicians and assistant nurses was recruited and trained. The questionnaire was previously validated in a pilot phase and contained requests for the following information: name of the prisoner; parents' names; age; marital status; ethnic group; birth place and nationality; schooling; previous prison sentences, if any; length of stay in the prison unit; history of tuberculosis; previous contact with tuberculosis cases; presence of coughing or expectoration; smoking habit; and history of any other lung disease.

Of the 1,492 inmates incarcerated in the prison, 99.0% were interviewed, and of the 1,136 inmates in the jail, 84.3% were interviewed. In total, 93.2% of the inmates in the two prison units were interviewed.

After the interview, nurses administered the tuberculin skin test (TST) using 0.1 mL of Purified Protein Derivative [PPD RT23 – 2 tuberculin units (TU)]. The tests were read after 72 hours by the same nurses who administered them.

The TST is used for the diagnosis of latent TB infection (LTBI).^a

The inmates were classified as "non-reactive" and "reactive". Prisoners presenting a palpable induration area of < 5 mm were classed as "non-reactive", and those presenting an induration area of \geq 5 mm were classed as "reactive".

A sample of sputum was collected from each participating inmate after the application of the TST regardless of clinical signs or symptoms.

^c Ministério da Justiça. Secretaria Nacional de Justiça. Departamento Penitenciário Nacional. Sistema de Informações Penitenciárias: informações consolidadas. Brasília; 2007 [cited 2008 Sep 22]. Available from: http://www.mj.gov.br/depen/sistema_infopen.htm.

^d Secretaria de Administração Penitenciária do Estado de São Paulo. Unidades prisionais São Paulo; 2010 [cited 2010 Oct 18]. Available from: <http://www.sap.sp.gov.br/common/unidades.html>.

^e Niero R. Tuberculose pulmonar em uma prisão: estudo de alguns aspectos epidemiológicos como subsídio para o seu controle [doctorate thesis]. São Paulo: Faculdade de Saúde Pública da USP; 1982.

^f Rozman MA. AIDS e tuberculose na Casa de Detenção de São Paulo [master's dissertation]. São Paulo: Faculdade de Saúde Pública da USP; 1993.

^g Kritski A, Melo FAF. Tuberculosis in adults. In: Palomino JC, Leão JC, Ritacco V editors. Tuberculosis 2007. Amedeo Textbook Awards; 2007 [cited 2011 Jan 05]. Available from: <http://www.tuberculosis-textbook.com>

The sputum smear examination and sputum culture was performed on the same day as the collection of the sputum sample at either the School of Public Health Mycobacteria Laboratory or the Public Health Laboratory of Guarulhos.

The sputum smear examination was performed according to the Ziehl-Neelsen method,^h and sputum culture was performed according to the Ogawa-Kudoh method.⁵ Positive cultures were sent to the Mycobacteria Laboratory of the Instituto Adolfo Lutz of São Paulo for identification and drug susceptibility testing (DST).

The Epidemiological Surveillance authorities of the region were advised of those inmates diagnosed with active TB or nontuberculous Mycobacteria (NTM) infections. They provided medications for the prison clinics, which treated inmates using the directly observed treatment, short-course strategy.

Data were entered in an EpiInfo 6 database, version 6.04;¹⁷ the analyzed data are shown in the tables.

The variables were compared using Pearson's chi-square (χ^2) association test, Fisher's exact test and the proportion test, and differences were considered significant for $p < 0.05$.

The study was approved by the respective Ethics Committees of the Faculdade de Saúde Pública of the Universidade de São Paulo, the State Health Department and the State Department of the Penitentiary Administration. Each prisoner who agreed to participate in the study signed a Declaration of Informed Consent.

RESULTS

Pearson's chi-squared association test found no statistically significant differences in the variables analyzed (Table 1), suggesting that the populations of the two units were similar.

An analysis of the epidemiological characteristics (Table 2) showed statistically significant differences in the following variables: history of TB, previous contact with TB, presence of coughing or expectoration and smoking habit.

Of the 786 (32.3%) prisoners who reported coughing, 55.0% had experienced this symptom for more than two weeks.^a Of the 220 (9.0%) prisoners with a history of a different respiratory tract disease, 79.5% reported bronchitis.

TSTs were performed on 2,237 (91.9%) inmates, 59.7% of whom were prison inmates and 40.3% of whom

were jail inmates. Of those who received the test, 1,633 (73.0%) were reactors to PPD, indicating LTBI. The principal reasons for the non-application of the TST among the other prisoners were refusal to consent to the test and non-appearance for the reading of the test.

Table 3 presents the sociodemographic characteristics of the 1,633 inmates with LTBI and the respective prevalence. The prevalence of LTBI was higher in prisoners with one or more of the following characteristics: aged 30-39 years; separated, divorced or widower; non-white; illiterate; from southern Brazil. There were statistically significant differences between inmates from the prison and the jail for region of origin (Table 3).

There were also statistically significant differences between the two facilities in previous contact with TB and smoking habit, but not in any of the other variables.

Among the 2,435 prisoners, sputum smears were obtained from 99.4% of the prisoners, and cultures were obtained from 98.9% of the prisoners (Table 4). Twenty-seven cultures were not carried out for the following reasons: 15 prisoners refused to collect sputum, and 12 culture medium tubes were contaminated.

There were no statistically significant differences between the two prisons units in either the sputum smear examination (Fisher's test) or the culture examination (Pearson's test).

The coefficient of prevalence of TB by the sputum smear was 289.3/100,000 inmates and by the culture was 1,079.7/100,000 inmates.

Of the 26 strains isolated in culture, 20 (76.9%) were identified as *M. tuberculosis*, and 6 (23.1%) were identified as NTM. Of those identified as NTM, one was *M. chelonae*, one was *M. peregrinum*, one was *M. frederiksbergense*, one was *M. terrae*, one was a slow-growing non-chromogenic Mycobacterium and one was a slow-growing scotochromogenic Mycobacterium.

The coefficient of prevalence of TB, according to the identification of the strains of mycobacteria isolated, was of 830.6/100,000 inmates.

The sociodemographic characteristics of the 20 inmates with active TB are presented in Table 5. The proportion test found no statistically significant differences for the variables analyzed.

There were statistically significant differences for a history of TB and previous contact with TB, but no significant differences for the other variables.

Of the 20 strains of *M. tuberculosis* identified, 19 (95.0%) were sensitive to anti-tuberculosis drugs and

^h Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância Epidemiológica. Manual nacional de vigilância laboratorial da tuberculose e outras micobactérias. Brasília; 2008.

Table 1. Sociodemographic characteristics of the inmates. State of São Paulo, Southeastern Brazil, 2008.

Sociodemographic characteristics	Prison N = 1,477		Jail N = 958		Total N = 2,435		χ^2	p
	n	%	n	%	n	%		
Age (years)								
18 to 29	801	54.2	540	56.4	1,341	55.1	5.95	0.11
30 to 39	427	28.9	237	24.7	664	27.3		
40 to 49	162	11.0	123	12.8	285	11.7		
≥ 50	87	5.9	58	6.1	145	5.9		
Marital status								
Single	748	50.6	473	49.4	1,221	50.1	1.40	0.50
Married	645	43.7	438	45.7	1,083	44.5		
Separated/divorced/ widower	84	5.7	47	4.9	131	5.4		
Ethnic group								
White	752	50.9	501	52.3	1,253	51.5	0.44	0.51
Non-white	725	49.1	457	47.7	1,182	48.5		
Origin (region)								
North	14	1.0	5	0.5	19	0.8	8.26	0.08
Northeast	347	23.5	271	28.3	618	25.4		
Central-west	21	1.4	12	1.3	33	1.4		
Southeastern	1,049	71.0	644	67.2	1,693	69.5		
South	46	3.1	26	2.7	72	2.9		
Education (years schooling)								
Illiterate	58	3.9	35	3.6	93	3.8	4.09	0.13
≤ 8	1,026	69.5	632	66.0	1,658	68.1		
> 8	393	26.6	291	30.4	684	28.1		

1 (5.0%) was resistant to streptomycin. In the prison, there were 14 prisoners with sensitive strains of *M. tuberculosis*, and one prisoner with a resistant strain.

DISCUSSION

The sociodemographic characteristics of the inmates of the two prison units were similar, and the populations were largely constituted of young, single individuals with little schooling, as is the profile of the majority of the world's prisoners.^{8,a,b}

There were a large number of cases of previous TB and of previous contact with sick inmates in the prison, whose prisoners are serving longer sentences and living with a greater risk of infection and illness from TB. However, the existence of coughing, expectoration and a smoking habit was less frequent in the prison population, probably because the symptoms were ignored, since coughing is considered "normal".

The greater number of reactors to TST in the prison, in all the categories of variables, reflects the structural characteristics of this prison unit, where the close contact is more prolonged than in the jail.

According to the Brazilian Ministry of Health,^a there is an association between use of tobacco and TB infection, TB disease, TB recurrence and mortality from the disease.

The high rate of LTBI in this population (73.0%) was greater than that estimated for the population of the Americas in general (25.0%, excluding the United States and Canada).¹⁶ Rates were also greater than those found in the various studies undertaken in other countries, such as those of Adib et al² (1999) in 21 prisons in Lebanon (45.0%) and those of Martin et al^{9,10} in penitentiaries in Spain in 1993 and 2000 (56.2% and 58.0%, respectively).

The percentage of cases of TB was greater in the prison, which was to be expected since the prison houses inmates with longer incarcerations.

The sensitivity of the sputum smear was 35% (seven sputum smears were positive of the 20 TB cases found by culture). This result was probably due to the collection of sputum from all the inmates, not just from those who presented respiratory symptoms, and due to the collection of only one sample of sputum from each

Table 2. Epidemiological characteristics of the inmates. State of São Paulo, Southeastern Brazil, 2008.

Epidemiological characteristics	Prison		Jail		Total		χ^2	p
	N = 1,477		N = 958		N = 2,435			
	n	%	n	%	n	%		
Previous tuberculosis								
Yes	71	4.8	25	2.6	96	3.9	7.41	0.006
No	1,406	95.2	933	97.4	2,339	96.1		
Previous contact with tuberculosis								
Yes	450	30.5	185	19.3	635	26.1	37.52	< 0.001
No	1,027	69.5	773	80.7	1,800	73.9		
Cough								
Yes	446	30.2	340	35.5	786	32.3	7.45	0.006
No	1,031	69.8	618	64.5	1,649	67.7		
Expectoration								
Yes	512	34.7	371	38.7	883	36.3	4.15	0.04
No	965	65.3	587	61.3	1,552	63.7		
Smoking								
Yes	800	54.2	568	59.3	1,368	56.2	6.2	0.01
No	677	45.8	390	40.7	1,067	43.8		
Another pulmonary illness								
Yes	136	9.2	84	8.8	220	9.0	0.14	0.71
No	1,341	90.8	874	91.2	2,215	91.0		

prisoner. According to the Brazilian Ministry of Health,^h there is an increase in the number of cases detected (10% to 14%) from the second sample and an additional increase (5% to 8%) from the third.

The culture results increased the positive TB diagnoses 3.7-fold. Regarding the identification of the Mycobacteria strains isolated, the culture increased the positive diagnostic findings 2.9-fold. These results agree with those of Abrahão et al.¹

The coefficient of prevalence of TB in this study was 830.6/100,000 inmates, a value 21.4 times higher than that of the Brazilian population (38.8/100,000)ⁱ and 21.2 times higher than that of the São Paulo State population (39.1/100,000).ⁱ

The prevalence of tuberculosis found in this study changes when it is calculated separately for each prison unit, being 1,029.5/100,000 for inmates of the prison and 525.7/100,000 for inmates of the jail. This result indicates that the characteristics of each prison unit influence the prevalence of TB.

These results agree with those of Niero,^e who found an average annual incidence of 1,073/100,000 inmates. Rozman^f observed an incidence of 2,650/100,000 in the

same prison. Oliveira & Cardoso¹¹ observed incidences in Campinas, Southeastern Brazil, of 1,397/100,000 in 1994 and 559/100,000 in 1999.

The prevalences in this study are lower than those found by Sánchez et al¹² in 2002, 2003 and 2005 in three prison units in Rio de Janeiro, Southeastern Brazil, the coefficients of which were 4,562/100,000 inmates in prison A, 6,271/100,000 in prison B and 8,600/100,000 in prison C.

Of the 20 inmates with active TB in this study, the highest incidence of the disease occurred in the following groups: prisoners aged 40-49 years in the prison (1,851.9/100,000 inmates) and those aged 30-39 years in the jail (843.9/100,000); separated, divorced or widower prisoners; prisoners with white skin color in the prison and those with non-white skin in the jail; illiterate inmates in the prison and those with less than eight years of schooling in the jail; and inmates from Southern Brazil in the prison and those from Northeastern Brazil in the jail.

According the Center of Epidemiological Surveillance of São Paulo, there is a trend of increasing TB rates among those 20 to 29 years of age (246.2/100,000 inhabitants). This group was responsible for 26.6% of the new cases of TB in the State of São Paulo in 2008.

ⁱ Ministério da Saúde. Série histórica da taxa de incidência de tuberculose. Brasil, regiões e unidades federadas de residência por ano de diagnóstico (1990 a 2010). Brasília; 2010[cited 2011 Aug 05]. Available from: http://portal.saude.gov.br/portal/arquivos/pdf/incidencia_tabela2.pdf

Table 3. Sociodemographic characteristics of the inmates with latent tuberculosis infection and incidence of latent tuberculosis infection. State of São Paulo, Southeastern Brazil, 2008.

Sociodemographic characteristics	Prison		Jail		Total		χ^2	p			
	Latent TB		Latent TB		Latent TB				TST applied		
	(N = 1,074)	Total of TST applied (N = 1,335)	(N = 559)	Total of TST applied (N = 902)	(N = 1,633)	(N = 2,237)					
	n	%	n	%	n	n					
Age (years)											
18 to 29	534	74.1	721	297	57.4	517	831	67.1	1,238	6.53	0.089
30 to 39	348	89.9	387	157	72.0	218	505	83.5	605		
40 to 49	131	87.3	150	82	71.3	115	213	80.4	265		
≥50	61	79.2	77	23	44.2	52	84	65.1	129		
Marital status											
Single	522	77.2	676	269	59.0	456	791	69.9	1,132	2.46	0.293
Married	485	83.3	582	265	65.3	406	750	75.9	988		
Separated/divorced/widower	67	87.0	77	25	62.5	40	92	78,6	117		
Ethnic group											
White	520	78.1	666	261	56.3	464	781	69.1	1,130	0.44	0.507
Non-white	554	82.8	669	298	68.0	438	852	77.0	1,107		
Origin (region)											
North	7	53.8	13	2	40.0	5	9	50,0	18	11.87	0.018
Northeast	247	79.2	312	171	66.5	257	418	73.5	569		
Central-west	17	85.0	20	6	54.5	11	23	74.2	31		
Southeastern	767	80.0	949	363	60.1	604	1,130	72.8	1,553		
South	36	87.8	41	17	68,0	25	53	80.3	66		
Education (years schooling)											
Illiterate	48	90.6	53	24	68.6	35	72	81.8	88	0.21	0,902
≤ 8	755	81.4	927	399	66.5	600	1,154	75.6	1,527		
> 8	271	76.3	355	136	50.9	267	407	65.4	622		

TB: tuberculosis; TST: tuberculin skin test

The frequency of drug resistant TB and multi-drug resistant TB (MDR-TB) is high in prisons and is related to inconsistent treatment and late detection of cases.^a

In this study, the 5% rate of bacterial resistance was lower than that reported by Abrahão et al¹ (14.3%) and that reported by Sánchez et al¹² (11.1%).

Table 4. Bacteriological examinations of the inmates. State of São Paulo, Southeastern Brazil, 2008.

Bacteriological examinations	Prison		Jail		Total		χ^2	p
	n = 1,477		n = 958		N = 2,435			
	n	%	n	%	n	%		
Sputum smear								
Negative	1,460	98.9	953	99.5	2,413	99.1	0,26*	
Positive	6	0.4	1	0.1	7	0.3		
Not carried through	11	0.7	4	0.4	15	0.6		
Culture								
Negative	1,438	97.3	944	98.6	2,382	97.8	1.74**	0,19**
Positive	19	1.3	7	0.7	26	1.1		
Not carried through	20	1.4	7	0.7	27	1.1		

*Fisher's exact test

**Pearson's chi-square association test

Table 5. Sociodemographic characteristics of the inmates with active tuberculosis and incidence of active tuberculosis. State of São Paulo, Southeastern Brazil, 2008.

Sociodemographics characteristics	Active TB prison (n = 15) n	Total of inmates prison (n = 1,477) n	Incidence of active TB/100.000 inmates prison	Active TB jail (n = 5) n	Total of inmates jail (n = 958) n	Incidence of active TB/100.000 inmates jail	Proportion test P
Age (years)							
18 to 29	8	801	998.8	2	540	370.4	0,1896
30 to 39	3	427	702.6	2	237	843.9	0,8401
40 to 49	3	162	1,851.9	1	123	813.0	0,4603
≥ 50	1	87	1,149.4	-	58	-	
Marital status							
Single	6	748	802.1	2	473	422.9	0,4235
Married	4	645	620.2	-	438	-	
Separated/divorced/widower	5	84	5,952.4	3	47	6,383.0	0,9214
Ethnic group							
White	10	752	1,329.8	2	501	399.2	0,0975
Non-white	5	725	689.7	3	457	656.5	0,9459
Origin (region)							
North	-	14	-	-	5	-	
Northeast	5	347	1,440.9	2	271	738.0	0,4126
Central-west	-	21	-	-	12	-	
Southeastern	9	1,049	858.0	3	644	465.8	0,3505
South	1	46	2,173.9	-	26	-	
Education (years schooling)							
Illiterate	3	58	5,172.4	-	35	-	
≤ 8	9	1,026	877.2	4	632	632.9	0,5839
> 8	3	393	763.4	1	291	343.6	0,4766

TB: tuberculosis

In a study undertaken by Aerts et al³ in European prisons, the rates of bacterial resistance varied from 0.6% in Spain to 50.0% in Estonia, with intermediate values of 2.4% in Portugal, 11.0% in Latvia and 27.9% in Azerbaijan.

Because of increases in the incidence of drug resistant TB and MDR-TB in prisons, performing cultures with identification and a drug susceptibility test is recommended, regardless of the result of the sputum smear.^a

Some of the limitations of this study include the possible error introduced by the refusal of a few prisoners to be tested. Because of operational difficulties, a second sample of sputum was not collected, and 12 culture tubes were contaminated. This study was also limited by the refusal of some prison inmates to take the tuberculin skin test and by the absence of some at the time of the reading because they were testifying at the Forum, they had been transferred to other prisons, or they had been released.

TB surveillance in institutions such as prisons, hostels, asylums and other places of long-term residence should

be organized so that there may be an active search for cases on the occasion of admittance, an active periodic search for cases, diagnostic investigation, examination of contacts whenever an infectious case is found and treatment under supervision. Better communication should be established between the responsible institutions, in accordance with the established norms.^a

The magnitude of the problem of TB in prisons in Brazil is not fully known, but in light of the results found in the few studies on TB in prisons, it is crucial to reduce overcrowding and to improve ventilation and lighting in prison units.

Without the control of TB in prisons, the control of the disease outside them will be practically impossible. The access of the inmate to health should not be considered a privilege but rather should be considered a constitutional right and a means of protecting the whole community, because the prevalence of TB and latent LTBI are much higher among the prison population than among the general population.

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