

Deaths attributed to tuberculosis in the state of Rio de Janeiro*

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Background: In 1998, tuberculosis incidence and mortality rates in the state of Rio de Janeiro (RJ) were the highest in Brazil. However, the RJ tuberculosis database (SINAN-TB-RJ) has proven unreliable.

Objective: To evaluate the current tuberculosis control program by analyzing tuberculosis-attributed deaths.

Methods: Descriptive studies of the SINAN-TB-RJ and tuberculosis mortality (SIM-TB-RJ) databases were carried out. Both databases were linked using the ReLink program. A study based on medical records was performed in the five hospitals where the greatest numbers of tuberculosis deaths occurred.

Results: In the SINAN-TB-RJ database, 16,567 cases were registered in adults (> 14 years of age). Pulmonary disease was present in 13,989 (84.5%), of whom 8223 (56.8%) presented sputum smears that were positive for acid fast bacilli. Anti-HIV testing, recommended for all patients with tuberculosis, was performed in only 4141 (25%) of tuberculosis cases. The SIM-TB-RJ database showed 1146 deaths that were attributed to tuberculosis. Only 478 (41.7%) of those had been reported to the health care system (SINAN-TB-RJ). Among the 302 medical records analyzed, 154 (50.9%) recorded hospitalizations of up to 10 days and 143 (47.3%) had respiratory symptoms for more than 60 days before diagnosis. Among 125 cases of retreatment, the RHZE regimen recommended by the Brazilian Ministry of Health was prescribed for only 43 (34.4%).

Conclusion: This study demonstrates weakness in the RJ tuberculosis control program, characterized by delayed diagnosis, limited use of the recommended tests, poor reporting, and non-compliance with the Ministry of Health guidelines.

Key words: Tuberculosis. Epidemiology. Program Evaluation

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INTRODUCTION

Tuberculosis (TB) is a serious international public health problem, especially in developing countries. Brazil ranks 15th among the 22 countries which report 80% of all TB cases worldwide.⁽¹⁾ Motivated by this, the Brazilian *Ministério da Saúde* (Health Ministry) declared TB a national priority in 1998. In 2000, the incidence of TB in the country was 48.4/100,000 inhabitants, representing 82,249 new TB cases, and the mortality rate was 3.7/100,000 inhabitants.⁽²⁾ Studies conducted in other countries have shown that, even under adverse socioeconomic conditions, a well-structured TB control program (TBCP) can alter scenarios such as that found in Brazil.⁽³⁾

Drugs currently used in the treatment of TB have proven to be highly efficacious. The most recent study on resistance carried out in Brazil showed that primary resistance was still uncommon and not responsible for many deaths.^(4,5) Therefore, death from TB is considered preventable.

In 1998, the state of Rio de Janeiro had the highest incidence of the disease in Brazil (98.8/100,000), as well as the highest mortality rate (8.5/100,000).^(4,5) Evaluation of TBCPs is based on a database called the *Sistema de Informação de Agravos de Notificação* (SINAN, Case-registry Database), which allows the principal mortality indicators to be calculated.

Morbidity studies are presently accepted as the gold standard in the assessment of damage caused by a disease. In Rio de Janeiro, findings of TB morbidity studies have been skewed because the databases have proven unreliable⁽⁷⁾. Ferreira, in a study on mortality caused by acquired immunodeficiency syndrome (AIDS), found that report forms were poorly filled out and contained typographical errors.⁽⁸⁾ In 2000, a review of the 1998 records in the SINAN database for TB in the state of Rio de Janeiro (SINAN-TB-RJ) resulted in the total number of TB cases being revised from 16,001 to 17,351. In the same year, only 15% of case outcomes were registered in the SINAN-TB-RJ database, invalidating any conclusions regarding the TB situation in Rio de Janeiro. A subsequent investigation revealed that 71% of those patients were cured, 19% did not adhere to the treatment and 7% died.⁽⁹⁾

Mortality is another indicator used in evaluation and planning. As for TB, the study of mortality was more important prior to chemotherapy, when

Siglas e abreviaturas utilizadas neste trabalho:

AIDS – Acquired immunodeficiency syndrome
ICD – International classification of diseases
DOTS– Directly observed treatment, short-course
HIV – Human immunodeficiency virus
CI – Confidence interval
WHO – World Health Organization
OR – Odds ratio
TBCP– Tuberculosis control program
RHZE– Rifampin, isoniazid, pyrazinamide and ethambutol
SIM – *Sistema de Informação de Mortalidade* (Mortality database)
SINAN – *Sistema de Informação de Agravos de Notificação* (Case-registry database)
TB – Tuberculosis

almost 50% of untreated cases had a fatal outcome.⁽¹⁰⁾ Mortality studies allowed prevalence to be estimated. Currently, death from TB is rare in developed countries. The TB mortality rate is a poor indicator of the extent of the problem since it only represents the prevalence of the disease in subgroups with biopsychosocial comorbidities rather than reflecting the magnitude of the disease in the general population. Therefore, death from TB should be rare.⁽¹¹⁾ When such a death occurs, it is typically representative of delayed diagnosis, difficulty in gaining access to treatment, or both.⁽¹²⁾

The state of Rio de Janeiro has a higher rate of mortality from TB than any other state in Brazil. However, to date, no systematic studies on deaths attributed to TB have been carried out in the state.

The objective of the present study was to analyze data on deaths attributed to TB in order to evaluate and propose interventions that would decrease mortality rates and improve disease control in the state.

METHODS

All records of patients older than 14 and diagnosed with TB in 1998 were included. These records were stored in two Health Ministry databases: the *Sistema de Informação de Mortalidade* (SIM, Mortality Database) for TB in the state of Rio de Janeiro (SIM-TB-RJ) and the SINAM-TB-RJ. Patients who died from other basic causes, such as AIDS, are automatically excluded from the database. All the patients registered in the SIM-TB-RJ who died in one of the five hospitals with the highest TB mortality rates were included in the medical records study.

This was a descriptive study, using data from medical records in combination with information from morbidity and mortality databases. The SINAN-TB-RJ and SIM-TB-RJ databases were linked using the Reclink program for the evaluation of variables.^(1,3) As a means of quality control, evaluation of variables was also performed manually.

Data from medical records were collected by medical students from the *Faculdade de Medicina da Universidade Gama Filho* (Gama Filho University School of Medicine), *Fundação Técnica Educacional Souza Marques* (Souza Marques Technical Education Foundation) and *Fundação Educacional Serra dos Órgãos* (Serra dos Órgãos Educational Foundation). The students used a specific investigative instrument (questionnaire), which was designed to collect demographic, epidemiological, and clinical data. Students received prior training through classes on ethics, TB-related topics and the theory and practice of scientific investigation, as well as on interpretation of death certificates. Three project researchers reviewed the questionnaires in order to verify the consistency of the data collected. The project was submitted to the Ethics Committees of the *Hospital Geral da Santa Casa da Misericórdia do Rio de Janeiro* (Santa Casa da Misericórdia General Hospital of Rio de Janeiro) and of the *Secretaria de Estado de Saúde do Rio de Janeiro* (Rio de Janeiro State Department of Health). Both committees approved the project in September of 2000.

Data were stored and analyzed using Epi-Info software, version 6.04. Odds ratios (ORs) was used as estimates of the association between independent variables and mortality. From the ORs, the 95% confidence intervals (95% CIs) were calculated.

RESULTS

According to SINAM, 82,931 TB cases were registered in Brazil in 1998, 16,990 (20.5%) of which were reported in the state of Rio de Janeiro. Of those 16,990 patients, 16,567 (97.5%) were older than 14. Median age was 37 years (ranging from 15 to 96) and 11,173 (67.4%) were male. A total of 14,208 (85.5%) of the reported cases and 255 (84.4%) of the reported deaths were concentrated in just ten cities.

Pulmonary TB was diagnosed in 13,989 (84.5%) of the Rio de Janeiro cases, making that the most common presentation of the disease. Sputum smear microscopy was positive in 8,223

(56.3%) of pulmonary cases and in 71 of the cases with extrapulmonary involvement. A total of 4,141 patients (24.9%) were submitted to human immunodeficiency virus (HIV) testing and 1,099 (26.5%) tested positive. Chest X-rays were taken of 15,997 patients (96.5%). A total of 3,495 patients (21.1%) were hospitalized at the time of diagnosis, and 190 (5.4%) of those patient died. Of those 190, 63 (33.2%) were registered as TB-related deaths in the SIM-TB-RJ database.

Among the 302 deaths evaluated in this study, 273 (90.3%) had been diagnosed with pulmonary TB. Bacteriological confirmation was positively correlated with mortality (OR = 1.63; 95% CI = 1.27 to 2.08).

According to the SIM-TB database, 6,029 TB-related deaths occurred in Brazil in 1998, 1159 (19.2%) of which were reported in the state of Rio de Janeiro. Of those, 1146 (98.9%) were patients older than 14. Median age was 50 years, ranging from 15 to 94 years. Of these 1146 deaths, 478 (41.7%) happened among patients whose TB was reported between 1995 and 1998 (Table 1).

Of the 1146 adult patients whose deaths were attributed to TB, 979 (85.4%) died in a hospital. Hospitals with the highest rates of TB mortality were the *Hospital Estadual Santa Maria* (Santa Maria State Hospital; 184 deaths – 16% of the total), *Instituto Estadual de Doenças do Tórax Ary Parreiras* (Ary Parreiras State Institute for Thoracic Disease; 50

TABLE 1
Year of case reporting in the 1995-1998 Rio de Janeiro Case-registry database and deaths registered in the 1988 Rio de Janeiro Mortality database

Year TB case was registered in the SINAN	Deaths registered in 1998 in the SIM (total = 1146) n (%)
1998	302 (26,4)
1997	104 (9,0)
1996	47 (4,1)
1995	25 (2,1)
Total	478 (41,7)

TB: tuberculosis; SINAM: *Sistema de Informação de Agravos de Notificação* (Case-registry database); SIM: *Sistema de Informação de Mortalidade* (Mortality database)

deaths – 4.4%), *Hospital Municipal Souza Aguiar* (Souza Aguiar City Hospital; 41 deaths – 3.6%), *Hospital Geral de Nova Iguaçu* (Nova Iguaçu General Hospital; 36 deaths – 3.1%), *Hospital Municipal Rafael de Paula e Souza* (Rafael de Paula e Souza City Hospital; 33 deaths – 2.9%), *Hospital Municipal de Duque de Caxias* (Duque de Caxias City Hospital; 28 deaths – 2.4%) and *Hospital Estadual Getúlio Vargas* (Getúlio Vargas State Hospital; 17 deaths – 1.4%). In 1062 (92.7%) of these cases, pulmonary or respiratory TB was listed as the cause of death without having been confirmed bacteriologically or histologically (International Classification of Diseases – ICD A16.2 and A16.9). Pulmonary TB had been confirmed (ICD A 15.0) in only 9 (0.8%) of the 1146 patients.

A sample consisting of 302 medical records was compiled from the registries of the five hospitals where there were the greatest numbers of deaths and where the 1998 files were available. The median interval between the onset of symptoms and TB diagnosis was 60 days (range, 7 to 730 days). Symptoms were present for more than 28 days in 81.7% of patients, and for more than 60 days in 47.3%. A total of 297 patients were diagnosed with pulmonary involvement (277 with pulmonary TB and 20 with pulmonary + extrapulmonary TB). Sputum smear microscopy was performed in 200 (67.3%), and 168 (84%) of those tested positive. Only 25 patients (8.3%) were submitted to *Mycobacterium tuberculosis* culture, and 18 (72.0%) of those tested positive. Culture was not performed in any extrapulmonary cases. Susceptibility tests were performed in 14 (77.8%) of the 18 positive cultures, and resistance to some drugs was found in 12 (85.7%). In 78 patients (25.8%), HIV testing was performed and 17 (21.8%) tested positive. Reporting of cases was more common when the diagnosis was confirmed by some method and when HIV-testing was performed (35.3% and 13.6%, OR = 3.45; 95% CI = 1.85 to 6.50) (Table 2).

Median hospital stay was 60 days and ranged from 0 to 517 days – 24 hours in 64 (21.2%) and more than a year in 13 (4.3%). Of the 244 patients for whom retreatment data were available, 125 (51.2%) underwent retreatment: 79 (63.2%) due to noncompliance with treatment, 35 (28.0%) due to relapse, and 9 (7.2%) due to unspecified causes. Of the 79 non-compliant patients, 28 (35.4%) were submitted to retreatment two or more times. Culture was performed in 23 (18.4%) of the 125 retreated patients. The therapeutic regimen recommended by the Health Ministry for retreatment – rifampin, isoniazid, pyrazinamide, and ethambutol (RHZE) – was used in 43 (34.4%) cases. Data on comorbidities were found in 221 (73.2%) medical records: smoking was reported in 143 (64.7%) cases and alcoholism in 141 (63.8%) cases.

DISCUSSION

Chaotic urbanization, the majority of the population living in urban zones (96.4% in 2000 – the highest in the country) and deficiencies in the public health system are probable reasons for the greater proportion of TB cases in Rio de Janeiro in comparison with other states.⁽¹⁴⁾

According to our findings, the median age of TB patients in Rio de Janeiro is still in the adult, rather than the elderly, range, suggesting exogenous transmission and high risk of infection.⁽¹⁵⁾ A study carried out in Salvador (in the state of Bahia), and another using national data, have shown an increasing risk for TB-related mortality in the elderly population, justified by the aging of the population and the influence of TB control programs.^(16,17) In Rio de Janeiro, as in most states, the prevalence is higher among males, which can be attributed to nongenetic factors.⁽¹⁸⁾ Of the ten cities with the greatest numbers of cases, eight are within the greater metropolitan area. Among these, the percentages of deaths in relation to the numbers of cases are comparable to the statewide total, corroborating the validity of using mortality studies as an operational tool.

TABLE 2
Factors correlated with reporting of the 302 tuberculosis-attributed deaths studied
(Rio de Janeiro, 1998)

	Reported n (%)	Unreported n (%)	OR (IC 95%)
Diagnostic confirmation	102 (77,9)	68 (39,8)	5,33 (3,08-9,27)
HIV testing ordered	54 (41,2)	24 (14,0)	4,3 (2,38-7,78)

OR: odds ratio; 95% CI: 95% confidence interval; HIV: human immunodeficiency virus

Pulmonary TB, the most common form of the disease, perpetuates disease transmission and presents high mortality rates. Sputum smear microscopy showed less positive results than expected, considering that, for the diagnosis of TB, the Health Ministry guidelines recommend performing two sputum smear microscopy tests, which increases sensitivity to 80%.⁽¹⁹⁾ Watanabe and Ruffino-Neto, in a study on TB conducted in Ribeirão Preto (in the State of São Paulo), also reported few positive sputum smears.⁽²⁰⁾ As for HIV testing, considering the World Health Organization (WHO) guidelines, which recommend that all patients diagnosed with TB be tested for HIV, it is alarming that 74% of the patients diagnosed with TB were not tested.⁽²¹⁾ It is possible that, in several of the reported cases of patients who had been submitted to treatment for 6 months, had not adhered to treatment or had died, those patients were unaware of the fact they were HIV positive. It is also important to highlight that 6.2% of the HIV tests given were negative and 6.6% were positive, leading us to believe that prior investigation, rather than diagnostic investigation at the moment of admission, was responsible for the testing. In addition, 96.5% of the patients were submitted to chest X-rays, demonstrating that the ease of access to this more costly diagnostic tool often leads physicians to forego sputum smear microscopy. Although it is important that all patients with a suspected diagnosis of TB be submitted to chest X-rays, bacteriological confirmation is essential.

Tuberculosis diagnosis and treatment must be carried out in clinics. Therefore, Rio de Janeiro hospitals should not be the main focus of the TBCP-RJ. However, in 1998, 21.1% of TB patients were hospitalized. Recommendations on epidemiological surveillance including biosafety, laboratories, and case-referral systems, are also essential in order to control TB in hospitals and protect medical staff.⁽²²⁾ It is important to realize that, according to the SINAN database, 190 patients died. However, only 63 of those were also included in SIM-TB-RJ. Since patients are only included in SIM-TB-RJ when the cause of death was definitely attributable to TB, we assume that the other 127 patients died from comorbidities or from causes other than TB.

The relationship of mortality and pulmonary TB to positive sputum smear microscopy reinforces the importance of making this group of patients a

priority in the directly observed treatment, short-course (DOTS). The WHO has recommended using DOTS for TB control.⁽²³⁾

The percentage of deaths registered in the SIM-TB-RJ database in relation to the total number of deaths in the country was similar to the percentage of cases in Rio de Janeiro in relation to the total number of cases in the country (19.2% and 20.5%, respectively). In 1999, Santo reported that, in addition to the 1157 deaths recorded in the SIM-TB-RJ database, there were 372 additional TB-related deaths in the state, increasing the mortality rate from 8.4/100,000 to 11.1/100,000 inhabitants.⁽²³⁾ Of these, most were older than 14 years of age (98.9%), which seems to reflect an effective immunization program, protecting children from tuberculous meningitis and disseminated TB, the most common causes of childhood mortality. The most important finding in the present study, the one that most caught the attention of the TBCP-RJ staff, was that only 478 (41.4%) of the 1146 patients who died represented reported cases. Since it is necessary for patients to be registered as reported cases in order to obtain anti-TB medication from basic health units, we can assume that most patients died without ever receiving any medication from these units. Case reporting is also mandatory in hospitals, which have medication on hand only for the initial treatment. If there is neither an epidemiological surveillance unit nor a TBCP in a hospital, the reporting of cases and the referral of patients to a basic health unit will depend on the staff rather than on the institutional protocol.⁽²⁵⁾ In a study conducted in São Paulo in 1996, Galesi reported that only 35.8% of deaths attributed to TB had been reported.⁽²⁶⁾

Most patients (979 – 85.4%) of those who died in Rio de Janeiro died in hospitals, but only 63 of these cases had been reported. Therefore, at least 4411 (26.6%) TB patients were hospitalized in Rio de Janeiro, 3495 of these were reported to SINAN, and 916 of these were not reported to SINAN but died in hospitals, which reinforces the importance of investment in TBCPs in hospitals.⁽²⁷⁾

We reviewed medical records from the five hospitals in which the greatest number (27%) of deaths attributed to TB occurred. This study showed deficiencies in the TBCP-RJ. The period between symptom onset and diagnosis was prolonged. The 1998 *Manual de Normas para o Controle da*

Tuberculose do Ministério da Saúde (Health Ministry Tuberculosis Control Guidelines) defined symptomatic respiratory patients as those who present with cough for more than 4 weeks, making them eligible for sputum smear microscopy. This recommendation was not followed in 81.8% of the cases. Other diagnostic procedures were also seldom performed. Sputum culture is especially recommended when sputum smear microscopy is negative, when there is a suspected diagnosis of extrapulmonary TB, or when resistance is suspected, for example, when critical patients have to be retreated due to relapse or noncompliance. Even under these situations, cultures were not performed – despite Health Ministry and WHO recommendations – and neither were susceptibility tests. Test results and the noncompliance with official guidelines indicate that a specific study on resistance to anti-TB drugs is urgent so that the dimensions of the damage can be properly assessed. Albuquerque suggested the same in a study on therapy outcomes conducted in Recife (in the state of Pernambuco).⁽²⁸⁾ It has been shown, empirically, that physicians do not ask for tests whose results they do not expect to receive, which may explain the small number of cultures requested. In accordance with the findings of other studies,⁽²⁹⁾ the rate of HIV testing found in the sample we studied was also low, even among those patients with extrapulmonary involvement.

Two interesting observations can be made regarding length of hospitalization. On the one hand, only 21.2% of the patients were hospitalized for 24 hours or less, showing the severity of the disease. On the other hand, it is surprising that the outcome for most long-term hospitalizations was mortality. There is a shortage of hospital beds in the state of Rio de Janeiro, not only for TB patients but also for patients in general. It seems that the available beds are not being allocated in an optimal fashion, a fact that was reported in a study carried out in reference hospitals.⁽³⁰⁾ Mean hospital stay in these hospitals was 44 days, versus 71.3 days in hospitals in São Paulo.⁽³¹⁾

The present study also confirmed previously demonstrated high rates of treatment noncompliance in the state. Delayed diagnosis, noncompliance with treatment, and underreporting of cases to epidemiological surveillance groups are all factors that perpetuate the disease.

Other Health Ministry guidelines were also not followed. The recommended retreatment regimen for TB patients in Brazil is RHZE for 6 months. This recommendation, like those mentioned above, was not followed in most cases.

Although the incidence of all comorbidities was higher than in the population in general, smoking and alcoholism ranked first in the list of problems identified in our study. Albuquerque, in a study carried out in Recife, emphasized that alcoholism is a risk factor for unfavorable outcome.⁽²⁸⁾ Any strategies for mortality prevention and TB control must include actions involving these two factors.

Case reporting correlated positively with bacteriological confirmation and with HIV testing, which makes us assume that these good practices are related. It is possible that able and committed professionals follow the guidelines despite the problems, reporting the case, as well as requesting bacteriological confirmation and HIV testing. In light of this, continuing education programs must be considered worthwhile.

One of the limitations of the present study was the poor quality of the data contained in databases and medical records. Approximately 200 records in the SIM-TB-RJ database were missing patient names, and the data therefore had to be requested from city authorities. Inconsistencies, duplications, incomplete records and lack of updating, as well as the methods used in the collection of some data, such as level of education and reason for hospitalization, negatively affected our study. Registries of medical records were disorganized, making their use as a data source very difficult.

The participation of medical students in operational studies allowed them to begin participating in scientific research and health care strategies. In this study, the students were afforded the opportunity of becoming familiar with one of the greatest public health problems. The indignation that arose among the students over the course of this study motivated them to form the *Liga Científica de Tuberculose* (Tuberculosis Science League), which has allowed students to participate in the TBCP-RJ, as well as in various research and outreach projects.⁽³²⁾

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