Clinical and epidemiological profile and prevalence of tuberculosis/HIV co-infection in a regional health district in the state of Maranhão, Brazil*

Perfil clínico e epidemiológico e prevalência da coinfecção tuberculose/HIV em uma regional de saúde no Maranhão

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Abstract

Objective: To describe the clinical and epidemiological profile, as well as the prevalence, of tuberculosis/HIV co-infection in the Regional Health District of Tocantins, which serves 14 cities in the state of Maranhão, Brazil. **Methods:** This was a descriptive epidemiological study based on secondary data obtained from individual tuberculosis reporting forms in the Brazilian Case Registry Database. We included all reported cases of tuberculosis/HIV co-infection, by city, between January of 2001 and December of 2010. **Results:** In the district, 1,746 cases of tuberculosis were reported. Of those tested for HIV, 100 had positive results, which corresponded to a tuberculosis/HIV co-infection prevalence of 39%. Of the co-infected patients, 79% were male, 42% were Mulatto, and 64% were in the 20- to 40-year age bracket, 31% had had ≤ 4 years of schooling, and 88% resided in the city of Imperatriz. Cases of pulmonary tuberculosis and new cases of tuberculosis predominated (in 87% and 73%, respectively). Of the co-infected patients, 27% had positive sputum smear microscopy results, and 89% had chest X-ray findings suggestive of tuberculosis. Sputum culture was performed in only 7% of the cases. **Conclusions:** Our results show that, because of its clinical and epidemiological profile, tuberculosis/HIV co-infection is still a major public health problem in the southwestern region of Maranhão. This situation calls for better coordination between tuberculosis and sexually transmitted disease/AIDS control programs, as well as a political commitment and greater involvement on the part of administrators and health care professionals in the planning of interventions and the functioning of health care facilities.

Keywords: Tuberculosis/epidemiology; HIV infections/epidemiology; Comorbidity.

Resumo

Objetivo: Descrever o perfil clínico e epidemiológico e a prevalência da coinfecção tuberculose/HIV na Unidade Regional de Saúde do Tocantins, que envolve 14 municípios no estado do Maranhão. **Métodos:** Estudo epidemiológico descritivo baseado em dados secundários das fichas individuais de tuberculose do Sistema Nacional de Informação de Agravos de Notificação. Foram incluídos todos os casos notificados de coinfecção tuberculose/HIV, por município de residência, no período entre janeiro de 2001 e dezembro de 2010. **Resultados:** Foram notificados 1.746 casos de tuberculose no distrito. Dos pacientes testados para HIV, 100 eram coinfectados. equivalendo a uma prevalência de 39%. Dos coinfectados, 79% eram do sexo masculino, 42% eram de cor parda, 64% tinham idade entre 20 e 40 anos, 31% tinham até quatro anos de estudo, e 88% residiam em Imperatriz. A forma clínica predominante foi a pulmonar (87%), e 73% eram casos novos. Dos coinfectados, 27% apresentaram resultados positivos na baciloscopia de escarro e 89% tinham imagem sugestiva de tuberculose na radiografia do tórax. A cultura de escarro foi realizada em apenas 7% dos casos. **Conclusões:** Evidenciou-se que a situação clínica e epidemiológica da coinfecção tuberculose/HIV ainda é um grande problema de saúde pública no sudoeste do Maranhão e impõe uma maior articulação entre os programas de controle de tuberculose e de doenças sexualmente transmissíveis/AIDS. Além disso, são necessários o compromisso e o envolvimento político dos gestores e profissionais de saúde no planejamento de ações e serviços de saúde.

Descritores: Tuberculose/epidemiologia; Infecções por HIV/epidemiologia; Comorbidade.

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Introduction

Tuberculosis continues to occupy a prominent place among the major infectious diseases in underdeveloped countries. The increase in tuberculosis cases has mostly been due to the emergence of AIDS in the 1980s, together with factors of impoverishment, social disorder, and lack of investment in effective disease control programs.[1]

Among the 22 countries that, together, account for 80% of all tuberculosis cases worldwide, Brazil ranks 19th in number of cases and 108th in incidence. In more explicit terms, in 2010 alone, there were approximately 71,000 reported cases of tuberculosis, 4,800 of which died, making tuberculosis the third leading cause of death from infectious diseases and the first leading cause of death among AIDS patients.[2] Mortality from tuberculosis is 2.4 to 19 times higher in individuals who are co-infected with HIV than in those who are not co-infected with HIV; therefore, one in every four deaths caused by tuberculosis is related to HIV.[3] In addition, for this specific population, the risk of developing active tuberculosis is 10% per year, whereas, for HIV-negative individuals, this risk is approximately 10% over the course of their lifetime.[4]

The rate of tuberculosis detection in advanced stages of AIDS is relatively low, given that only a few patients will present the typical-clinical radiological findings of tuberculosis. Furthermore, test positivity rates are unfortunately low in these patients, leading to late diagnosis in a significant number of patients, which prevents early treatment initiation and contributes to bacillary dissemination in the community.[5]

Also in the clinical sphere, it is important to mention that HIV infection changes the clinical presentation of tuberculosis, treatment duration, tolerance to antituberculosis drugs, resistance to the available drugs, and, possibly, contact susceptibility.[6,7]

Undoubtedly, a diagnosis of HIV seropositivity in tuberculosis patients is a potent weapon in disease control.[2] However, in Brazil, the demand for HIV testing is still low,[8] despite the recommendation of the Brazilian National Ministry of Health (all tuberculosis patients should undergo HIV testing).[2] In this context, it is of note that a lower proportion of patients tested for HIV translates to greater uncertainty regarding the true magnitude of the prevalence of co-infection.[9]

In addition to the entire clinical trajectory that hinders tuberculosis control, it is also necessary to consider social aspects. Studies have demonstrated that the emotional and economic impact of tuberculosis/HIV co-infection is greater than that of tuberculosis or HIV infection alone. This perpetuates a poor quality of life, possibly associated with the stigma or social ills of the combined diseases.[10] In addition, the prevalence of tuberculosis/HIV co-infection, as well as of tuberculosis alone, is unevenly distributed and mainly affects the most marginalized and poorest segments of society, i.e., those that are the most receptive and vulnerable to the disease.[11]

Given the complexity of the situation of tuberculosis/HIV co-infection, as well as the need for specific strategies and interventions that prioritize resources for the most vulnerable groups, and especially because of the lack of studies conducted in the region referred to below and examining the profile and prevalence of tuberculosis/HIV co-infection, it is essential to understand the epidemiological profile of this comorbidity in the various areas in Brazil, as well as in the 14 cities in the southwestern region of the state of Maranhão that are served by the *Unidade Regional de Saúde do Tocantins* (URST, Regional Health District of Tocantins).

In view of these facts, tuberculosis/HIV co-infection is an important indicator of the quality of the health care facilities, and this opens up possibilities for reflection on health care practices in the region and on the challenges faced by the country in devising a control policy that is socially relevant. Therefore, the objective of the present study was to determine the prevalence of tuberculosis/HIV co-infection in the URST and to describe the clinical and epidemiological profile of the co-infected cases.

Methods

This was a descriptive epidemiological study based on secondary data collected at the URST Epidemiological Surveillance Center, using tuberculosis reporting forms in the Brazilian Ministry of Health *Sistema Nacional de Informação de Agravos de Notificação* (SINAN, National Case Registry Database).

The state of Maranhão is currently one of the federal units with the highest social inequality,

and the region investigated in the present study provides low levels of human opportunity, with cities having an index of social exclusion of approximately 0.31 and a Human Development Index of 0.58 in 2010. These figures are close to those reported in sub-Saharan African countries. The URST is located in southwestern Maranhão and serves 14 cities: Amarante; Buritirana; Campestre; Davinópolis; Estreito; Governador Edson Lobão; Imperatriz; João Lisboa; Lajeado Novo; Montes Altos; Porto Franco; Ribamar Fiquene; São João do Paraíso; and Senador La Rocque. Together, the cities served by this regional health district cover a geographical area of 22,773.853 km^2, have a population of 478.220 people, and have a life expectancy at birth of 61.5 years or less.[12]

We included all reported cases of tuberculosis between January of 2001 and December of 2010. The sociodemographic variables assessed were gender, age bracket, race, level of education, city of residence, and area of residence. The epidemiological data analyzed here were clinical presentation; status at admission; results of sputum smear microscopy, tuberculin skin testing (TST), culture, and HIV testing; provision of supervised treatment; and treatment outcome.

Data collection was carried out in September of 2011, after authorization was obtained from the Epidemiological Surveillance Center Coordination Board. To that end, we used a pre-coded form containing the variables under consideration. To prepare the form, we used exclusively the official data input document for SINAN, i.e., the individual tuberculosis reporting form. Subsequently, the information was entered into a second database and analyzed using the Epi Info program, version 6.5.3. Finally, to present the information, we created tables showing the absolute and relative values found in the study.

The study was submitted to the Research Ethics Committee of the Federal University of Maranhão University Hospital (Process no. 005712/2011-80), and a waiver of approval was granted (Protocol no. 36/12), given that the study does not meet the evaluation criteria requirements established in Brazilian National Health Council Resolution no. 196/96 and its complementary regulations.

Results

The study reference population consisted of 1,746 reported cases of tuberculosis in the URST, by city, between 2001 and 2010. Table 1 shows the HIV serostatus of the reported cases: 1,414 (81.0%) of the total number of reported cases did not undergo HIV testing; and, of the 332 (19.0%) that underwent testing, 100 (30.1%) tested positive, 156 (47.0%) tested negative, and 76 (22.9%) were still waiting for the results at this writing. In the city of Imperatriz, there

Table 1 - HIV serostatus of the reported cases of tuberculosis in the Regional Health District of Tocantins, Maranhão, 2001-2010, by city.[a]

City	Tuberculosis cases	HIV testing		HIV testing result		
		Not performed	Performed	Positive	Negative	Pending
Amarante	166 (9.51)	159 (95.78)	7 (4.22)	1 (14.29)	4 (57.13)	2 (28.58)
Buritirana	12 (0.69)	12 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Campestre	14 (0.80)	8 (57.14)	6 (42.86)	1 (16.70)	3 (50.00)	2 (33.30)
Davinópolis	53 (3.04)	43 (81.13)	10 (18.87)	4 (40.00)	5 (50.00)	1 (10.00)
Estreito	35 (2.00)	30 (85.71)	5 (14.29)	0 (0.00)	3 (60.00)	2 (40.00)
Governador Ed. Lobão	42 (2.41)	40 (95.24)	2 (4.76)	0 (0.00)	1 (50.00)	1 (50.00)
Imperatriz	1.207 (69.13)	940 (77.88)	267 (22.12)	88 (32.96)	115 (43.07)	64 (23.97)
João Lisboa	72 (4.12)	66 (91.67)	6 (8.33)	2 (33.33)	4 (66.67)	0 (0.00)
Lajeado Novo	3 (0.17)	3 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Montes Altos	34 (1.95)	27 (79.41)	7 (20.59)	0 (0.00)	7 (100.00)	0 (0.00)
Porto Franco	25 (1.43)	15 (60.00)	10 (40.00)	1 (10.00)	6 (60.00)	3 (30.00)
Ribamar Fiquene	10 (0.57)	7 (70.00)	3 (30.00)	1 (33.33)	2 (66.67)	0 (0.00)
São João do Paraíso	6 (0.34)	5 (83.33)	1 (16.67)	0 (0.00)	1 (100.00)	0 (0.00)
Senador La Rocque	67 (3.84)	59 (88.07)	8 (11.94)	2 (25.00)	5 (62.50)	1 (12.50)
Total	1,746 (100.00)	1,414 (81.00)	332 (19.00)	100 (30.10)	156 (47.00)	76 (22.90)

[a]Values expressed as n (%). Source: SINAN-net, Epidemiological Surveillance Center-Regional Health District of Tocantins (2011).

were 88 cases (88%) of co-infection, and HIV testing coverage of tuberculosis patients was 22.12%. In the cities of Buritirana and Lajeado Novo, none of the reported cases underwent serologic testing.

The prevalence of tuberculosis/HIV co-infection in the study population was 39%, on the basis of HIV testing results, except for testing that was in progress. The sociodemographic characteristics of these cases are shown in Table 2. Most of the co-infected patients resided in the urban area (92%) and were male (79%). In addition, a large number of the co-infected patients were in the 20- to 40-year age bracket (64%), were Mulatto (42%), and had had ≤ 4 years of schooling (31%).

According to Table 3, which shows the epidemiological data, cases of pulmonary tuberculosis and new cases of tuberculosis predominated (in 87% and 73%, respectively). Of the co-infected patients, 27% had positive sputum smear microscopy results (1st sample), and 89% had chest X-ray findings suggestive of tuberculosis. Sputum culture and TST were performed in only 12% of the cases. It can also be seen that 57% of the co-infected patients underwent supervised treatment and that the cure rate was 62%. In addition, in 54% of the cases, no data were available on the microscopy results from the second sputum sample.

Table 2 - Sociodemographic characteristics of the 100 cases of tuberculosis/HIV co-infection in the Regional Health District of Tocantins, Maranhão, 2001-2010.[a]

Variable	Result
Gender	
Male	79 (79)
Female	21 (21)
Age bracket, years	
< 20	10 (10)
20 ⊢ 40	64 (64)
40 ⊢ 60	18 (18)
≥ 60	8 (8)
Race	
White	32 (32)
Black	10 (10)
Asian	4 (4)
Mulatto	42 (42)
Indigenous	2 (2)
No data	9 (9)
Area	
Urban	92 (92)
Rural	7 (7)
No data	1 (1)
Level of education	
No schooling	9 (9)
≤ 4 years	31 (31)
5 to 8 years	23 (23)
> 8 years	26 (26)
No data	7 (7)
Not applicable	4 (4)

[a]Values expressed as n (%). Source: SINAN-net, Epidemiological Surveillance Center-Regional Health District of Tocantins (2011).

Discussion

According to the World Health Organization 2011 report on tuberculosis control, 23% of tuberculosis patients diagnosed in Brazil in 2010 were infected with HIV.[13] Of the reported cases of tuberculosis in the URST between 2001 and 2010 that underwent HIV testing, 39% were found to be infected with HIV. Studies conducted in Brazil showed that the prevalence of tuberculosis/HIV co-infection was 42.4% in the city of Taubaté, located in the state of São Paulo,[3] 33.3% in the city of Recife, located in the state of Pernambuco,[14] 31.2% in the city of Ribeirão Preto, located in the state of São Paulo,[8] 29.2% in the city of Porto Alegre, located in the state of Rio Grande do Sul,[15] 14.9% in the city of Londrina, located in the state of Paraná,[10] 3.6% in Fortaleza, located in the state of Ceará[16], and 0.8% in the city of Bagé, located in the state of Rio Grande do Sul.[17] It is of note that these differences might be related to variations associated with the type of study or to true differences in the prevalence of HIV infection in tuberculosis patients.

It is possible that the prevalence of co-infection in the area under study is below the national average, and this might be associated with the low demand for HIV testing in the area, given that most patients (81.0%) did not undergo HIV testing, as shown in Table 1.

The *Programa Nacional de Controle da Tuberculose* (PNCT, Brazilian National Tuberculosis Control Program) aims to make HIV testing available to 100% of individuals with tuberculosis.[4] In each of the 14 cities under study, less than 50% of the cases underwent HIV testing. Therefore, it is clearly necessary that the proposal that all patients diagnosed with tuberculosis should undergo HIV testing be effectively implemented, given that reliable reporting of tuberculosis/HIV

Table 3 - Clinical and epidemiological characteristics of the 100 cases of tuberculosis/HIV co-infection in the Regional Health District of Tocantins, Maranhão, 2001-2010.[a]

Variable	Result
Status at admission	
New case	73 (73)
Recurrence	19 (19)
Readmission following dropout	4 (4)
Transfer	4 (4)
Clinical presentation	
Pulmonary	87 (87)
Extrapulmonary	11 (11)
Pulmonary + extrapulmonary	2 (2)
Sputum smear microscopy, 1st/2nd sample	
Positive	27 (27)/12 (12)
Negative	27(27)/18(18)
Not performed	46(46)/15(15)
No data	0 (0)/54 (54)
Tuberculin skin testing	
Negative	6 (6)
Weakly positive	1 (1)
Strongly positive	2 (2)
Not performed	88 (88)
No data	3 (3)
Sputum culture	
Positive	4 (4)
Negative	5 (5)
Pending	3 (3)
Not performed	88 (88)
Chest X-ray	
Suspicious	89 (89)
Normal	1 (1)
Other pathologies	2 (2)
Not performed	6 (6)
No data	2 (2)
Supervised treatment	
Yes	57 (57)
No	34 (34)
No response	1 (1)
No data	8 (8)
Outcome	
Cure	62 (62)
Dropout	8 (8)
Death from tuberculosis	1 (1)
Death from other causes	22 (22)
Transfer	6 (6)
Change in diagnosis	1 (1)

[a]Values expressed as n (%). Source: SINAN-net, Epidemiological Surveillance Center-Regional Health District of Tocantins (2011).

co-infection is essential for appropriate planning of control measures and for the holistic care of the patient.

The data on HIV serostatus in tuberculosis patients revealed that there were a considerable number of reported cases of tuberculosis (22.9%) for which there were no definitive HIV testing results, i.e., the database contained cases for which testing was in progress. These figures regarding the URST might be the result of failures in the health care structure, such as difficult access to laboratory facilities, delay in receiving the results from the laboratory, mislaid specimens or results, or lack of regular updating of the database system. Therefore, significant losses associated with delayed diagnosis occur as a function of an inadequate infrastructure and deficient information flow within the health care network.[18]

Considering the reported cases of tuberculosis/HIV co-infection in the URST by city, we found that the city of Imperatriz, which is one of the 19 priority cities for tuberculosis control in the state of Maranhão, is noteworthy in that it had the highest number of cases (88.00%). This might be due to the existence of the Municipal Sexually Transmitted Disease/HIV/AIDS Control Program, which was implemented in 1998. The other cities in this health district do not have an implemented AIDS control program. However, they have had qualified professionals to perform rapid HIV testing since 2007. Although the city of Imperatriz has a functioning control program and the other cities have professionals trained to diagnose HIV/AIDS, HIV testing coverage still falls far short of the recommendation by the PNCT. Consequently, it is necessary to implement changes to the health care structure to ensure that all tuberculosis patients undergo HIV testing.

The reporting and analysis of cases of tuberculosis/HIV co-infection are relevant components of an epidemiological assessment system, which is minimally satisfactory when it makes it possible to estimate the situation of diseases in a specific population or area, as well as to assess the potential impact of control measures.[4]

The sociodemographic characteristics of the co-infected patients are similar to the patient characteristics described in various studies conducted in Brazil, where tuberculosis/HIV co-infection predominantly affects males.[3,8,10,15,19,20]

However, it is not yet clear whether, in fact, there is a gender disparity in the prevalence of co-infection or whether confounding factors, such as differences in access to treatment or stigmatization, are involved.[20]

The fact that the highest occurrence was found in the 20- to 40-year age group suggests that the patients are young adults in the most productive phase of their life, which causes economic losses and subsequently has social repercussions for patients, families, and society. These data are in agreement with those reported in the literature,[3,9,10,14,15,19-22] which confirm that this age group is the target of the tuberculosis and AIDS epidemics, and this might be related the lifestyle of young adults, who engage in risky behaviors, such as not using condoms, and deny any possibility of infection because of their feeling of protection or emancipation, resulting in greater exposure to HIV and *Mycobacterium tuberculosis*.

Another observed trend was that there were patients in the 40- to 60-year age bracket, as well as cases of tuberculosis in patients over 60 years of age, raising the age bar for those affected by tuberculosis and HIV/AIDS. This finding is in agreement with what is stated in PNCT documents,[2] which indicate a trend toward an increase in co-infection rates among men over 40 years of age.

In our sample, there was a predominance of Mulatto patients (42%), which is in contrast to the findings of other studies conducted in Brazil.[21,23] In addition, in the literature, the risk for this co-infection has been reported to be higher in Black subjects,[24] whereas, in the present study, this was not confirmed, since the prevalence of tuberculosis was lower in Blacks than in Whites. Although increased risk seems to have a more significant relationship with socioeconomic conditions than with ethnicity, studies conducted in the USA and involving socially disadvantaged populations have also shown a higher prevalence of tuberculosis in Black subjects.[25,26]

The magnitude of tuberculosis/HIV co-infection goes beyond biological barriers and is a serious social problem. The vulnerability of individuals is evidenced by their lack of awareness of the imminent risks they face, which hinders the practice of self-care and results in significant difficulties for health care providers.[21] The predominance of co-infection in individuals with a low level of education (i.e., individuals who have had ≤ 4 years of schooling), found in the present study, reflects the educational situation in Brazil, a situation characterized by functional illiteracy, which results from high dropout rates throughout the school system.[22] In addition, 54% of the co-infected patients had had only up to 8 years of schooling (without considering the 9% who had had no schooling). The professional chances of this group are a cause for concern, since they are restricted to unfavorable living and working conditions, which maintain the state of impoverishment. It is exactly in this population that the incidence of HIV infection is high, promoting the maintenance of unfavorable social conditions and fostering an environment that is conducive to increasing the prevalence of tuberculosis. Therefore, this comorbidity is significantly associated with social factors (level of education) and collective factors (social deprivation and marginality).[3,21]

Pulmonary tuberculosis was found to be the most common clinical presentation of the disease in the co-infected patients (in 87%). Similar results were found in other studies.[3,10,19,22] Tuberculosis can become active at any stage of the progression of HIV infection, but, in patients with severe immunological impairment who are treated at tertiary care facilities, extrapulmonary tuberculosis is the most common clinical condition,[3] which is in contrast to the situation found in the present study.

Early diagnosis of tuberculosis in HIV-infected patients and treatment initiation interrupt disease progression, which causes improvement in clinical status, with positive effects on prognosis.[27] Studies have highlighted that, although sputum smear microscopy is the primary diagnostic test for tuberculosis because of its low cost and simplicity, the limitations of smear microscopy require that culture be performed.[28]

In the present study, we found that few patients underwent sputum smear microscopy, TST, and culture, which, to some extent, hinders early diagnosis and, consequently, appropriate patient care. The situation is a cause for even greater concern given that chest X-ray was prioritized in the detection of suggestive cases of tuberculosis (in 89%). In this sense, there is an urgent need that the challenging situations be improved by administrators and health care professionals, especially in health care, so that early diagnosis can in fact be established.

Supervised treatment is a strategy that, in addition to its therapeutic focus, allows welcoming, bonding, and responsibility, increasing the capacity of professionals and patients to interact with one another, with the prospect of ensuring better quality of care and patient adherence to treatment.[4] According to the data collected, supervised treatment reached 57% of the co-infected patients, i.e., it exceeded the 48% rate found in the city of Ribeirão Preto, located in the state of São Paulo,[8] and was below the 65% rate reported in the city of São José do Rio Preto, also located in the state of São Paulo.[29]

The epidemiological trend of tuberculosis in immunocompromised individuals is different from that in immunocompetent individuals, since the former are more likely to develop resistance to antituberculosis drugs. In addition, infection with *M. tuberculosis* accelerates HIV replication, which can make cure difficult and result in increased mortality for co-infected patients.[3] Analysis of treatment outcomes revealed that the cure rate was 62%, which is below the rate recommended by the Brazilian National Ministry of Health (85%).[2] This finding suggests that local public health care facilities should reevaluate their strategies for patient monitoring during tuberculosis treatment and for discharge, which should occur after confirmation of cure. The proportion of treatment dropout (8%) exceeds the 5% rate recommended by the Brazilian National Ministry of Health,[2] whereas the rate of death from tuberculosis (1%) is below the 9% rate reported in other studies.[29,30]

It is also important to mention that there were failures related to data entry into the database system. There were a considerable number of fields which read "no data" for some variables, such as sputum smear microscopy (2nd sample), TST, chest X-ray, and supervised treatment. These failures can be attributed to health care professionals or to data entry clerks. The lack of information on reporting forms can ultimately lead to case underreporting and can generate a misleading picture of the health status of the population, thereby resulting in interventions that fall short of meeting their real needs. This changes, especially, the quality of care that will be provided.

The failures identified in the present study underscore the importance of developing human resources and of monitoring data recording and the database system. In this sense, it is essential that the database system be effectively monitored and that there be communication between those responsible for managing the database system and the health care professionals working in the public health care system.

Improving the quality of data recording in terms of the completeness of forms and the updating of data is fundamental to the reliability of epidemiological analyses. From this perspective, the present study demonstrated that periodic review of the SINAN database, as well as of registries, is an essential activity for case reporting and outcome data completeness. Finally, we highlight the need to share the analyses of the SINAN data with the health care professionals who monitor the cases and fill out the reporting forms so that they understand the importance of appropriate data recording and feel motivated to ensure the quality of the data collected.

Our results show that, because of its clinical and epidemiological profile, tuberculosis/HIV co-infection is a major public health problem in the southwestern region of Maranhão. This situation calls for better coordination between tuberculosis and sexually transmitted disease/AIDS control programs, as well as a political commitment and greater involvement on the part of administrators and health care professionals in the planning of interventions and the functioning of health care facilities.

Knowledge of the clinical and epidemiological aspects of tuberculosis/HIV co-infection is a key element in devising strategies aimed at reducing the damage caused by the association of tuberculosis and HIV/AIDS, thereby increasing survival and improving patient quality of life. Resolving these situational aspects of the health care systems is essential for care that is holistic, results in a greater resolution, and has a chance of reducing the burden of tuberculosis in the different contexts.

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