Tuberculosis/HIV coinfection associated factors regarding the 2001-2011 timeframe

Fatores associados à coinfecção tuberculose/HIV no período 2001-2011

Factores asociados a la coinfección tuberculosis/VIH en el período 2001-2011

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ABSTRACT

Objective: The study's aim has been to analyze the factors associated with Tuberculosis/HIV coinfection and to determine the maximum and minimum prevalence of HIV test positivity among tuberculosis cases in Maranhão State during the 2001-2011 period. **Methods**: It is a cohort study that was performed by analyzing data from the *Sistema de Informações sobre Agravos de Notificações (SINAN)* [Disease Aggravation Information System]. Poisson's regression model was used with robust variance adjustment in order to identify associations. **Results**: The Tuberculosis/HIV coinfection prevalence was 15.1%. From a gross data analysis, the significant associations for coinfection were, as follows: male gender, age groups from 20 to 39 years old and from 40 to 59 years old, schooling less than 8 years, entry by transfer and termination by abandonment/death. In the adjusted analysis, male gender, age range from 20 to 39 years old, schooling less than 8 years and termination due to abandonment/death remained associated with the coinfection. **Conclusion**: The Tuberculosis/HIV coinfection rate was found high and also associated with several factors related to health in Maranhão State.

Keywords: Tuberculosis, coinfection, comorbidity, HIV infections, epidemiology.

RESUMO

Objetivo: Analisar os fatores associados à coinfecção tuberculose/HIV e determinar a prevalência máxima e mínima da positividade do teste anti-HIV entre casos de tuberculose no Maranhão, no período de 2001 a 2011. **Métodos**: Estudo transversal realizado mediante consulta aos dados do Sistema de Informação de Agravos de Notificação. Para identificar associações, utilizou-se a regressão de Poisson com ajuste robusto da variância. **Resultados**: A prevalência da coinfecção tuberculose/HIV foi de 15,1%. Na análise bruta, as associações significativas para coinfecção foram sexo masculino, faixas etárias de 20 a 39 anos e de 40 a 59 anos, escolaridade inferior a oito anos, entrada por transferência e encerramento por abandono/óbito. Na análise ajustada, sexo masculino, faixa etária de 29 a 30 anos,

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escolaridade inferior a oito anos e encerramento por abandono/óbito permaneceram associados à coinfecção. **Conclusão**: Foi observada alta taxa de coinfecção tuberculose/HIV no estado do Maranhão e associações com diversos fatores relacionados à saúde.

Descritores: Tuberculose, Coinfecção, Comorbidade, Infecções por HIV, Epidemiologia.

RESUMEN

Objetivo: Analizar los factores asociados a la coinfección TB/VIH y determinar la prevalencia máxima y mínima de la prueba del VIH positiva entre los casos de TB en Maranhao, de 2001 a 2011. **Métodos**: Estudio transversal, realizado en consulta con los datos del Sistema de Información de Agravios y Notificaciones. Para identificar asociaciones, se utilizó regresión de Poisson con ajuste robusto de la varianza. **Resultados**: La prevalencia de la coinfección TB/VIH fue del 15,1%. En el análisis crudo, asociaciones significativas para la coinfección fueron sexo masculino, edades de 20-39 años y 40-59 años, educación menos de ocho años y cierre de la entrada por abandono/muerte. En el análisis ajustado, sexo, edad 29-30 años, educación menos de 8 años y final por abandono/muerte se mantuvo asociado con la coinfección. **Conclusión**: Hubo una alta tasa de coinfección TB/VIH en el estado de Maranhão y asociaciones con diversos factores relacionados a la salud.

Descriptores: Tuberculosis, Coinfección, Comorbilidad, Infecciones por VIH, Epidemiología.

INTRODUCTION

Tuberculosis (TB) continues to be an important public health problem in Brazil despite advances in both the detection of new cases and the introduction of potent drugs.[1] Among the factors aggravating the problem are the persistence of poverty, access, disorganization and inefficiency of health services, marginal populations growth, migratory flows, population aging and the advent of the human immunodeficiency virus (HIV).[2]

HIV infection is the most potent activator of TB.[3-4] The risk of tuberculosis infection progressing to active disease in the presence of TB/HIV coinfection is 5 to 15% per year, or 50% during lifetime, while the TB mortality rate increases from 2.4% to 19.0% in relation to patients without coinfection.[5-6]

In 2010, the average prevalence of coinfection in Brazil was 23%, varying from 6.2% to 44.3% in the different regions of the country.[1,2,7-8] Maranhão State is one of the priorities among those that were selected by the Health Ministry for TB controlling.[9]

Epidemiology is an indispensable tool for the delivery of health care services. Through epidemiological studies, nurses can obtain important inputs for planning, administering, implementing and evaluating health care. This study aims to analyze the factors associated with TB/HIV coinfection and to determine the maximum and minimum prevalence of HIV test positivity among tuberculosis cases in Maranhão State during the 2001-2011 period.

METHODS

It is a cohort and an analytical study of tuberculosis cases reported in Maranhão State from 2001-2011 timeframe.

Tuberculosis cases reported in the State during the period mentioned were consulted through the *Sistema de Informações sobre Agravos de Notificações (SINAN)* [Disease Aggravation Information System]. Cases of tuberculosis with positive bacilloscopy and anti-HIV testing were included, and data from incomplete notification and change of diagnosis were excluded. Inconsistencies, incompleteness and duplicities have been eliminated.

The variables selected for the study were, as follows: TB/HIV coinfection, sex, age, race, schooling, residence area, clinical form, mode of entry into the surveillance system, case termination, sputum smear microscopy, sputum culture and anti-HIV testing. The maximum prevalence of HIV test positivity was calculated by the ratio of the number of HIV positive tuberculosis cases to the number of tuberculosis cases that performed the anti-HIV test. The minimum prevalence was the ratio between the number of tuberculosis cases with the HIV positive test and the total number of tuberculosis cases.
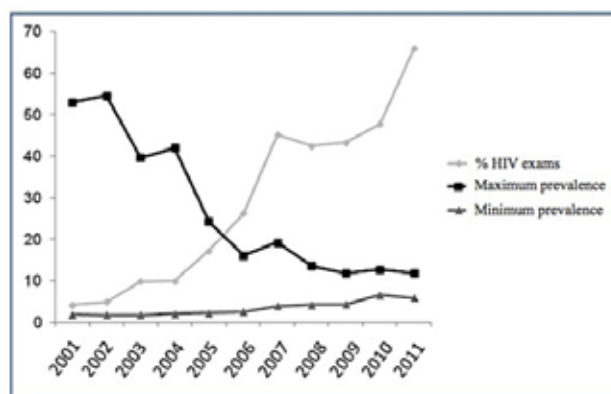
Statistical analyzes were performed in the Stata program, version 11.0. In order to identify factors associated with TB/HIV coinfection, the Poisson's regression model was used. The prevalence ratios and their respective 95% confidence intervals were estimated. The study was approved by a Research Ethics Committee under the Legal Opinion 240/11 and Protocol No. 003606/2011-60.

RESULTS AND DISCUSSION

The total number of tuberculosis cases reported between January 2001 and December 2011 was 25,715, out of which 4,553 were included in the study. With regards to those cases, 689 tested positive for HIV. The estimated maximum prevalence was 15.1% and the minimum prevalence was 2.7%. There was a decrease in the range between the maximum and minimum prevalence of coinfection over the years.

Over the study period, the maximum prevalence ranged from 52.9% to 11.8% and the minimum prevalence from 1.8% to 5.9%. Anti-HIV tests ranged from 4.3% to 65.9% (**Figure 1**).

Figure 1 - The prevalence of anti-HIV tests performed and TB/HIV coinfection in Maranhão State over a 10 years' timeframe.

It was observed that among the cases of tuberculosis that presented the negative and positive anti-HIV test the predominant characteristics were: male gender, age group from 20 to 39 years old, non-white race, schooling less than or equal to 8 years, urban, new cases, pulmonary clinical form, termination by cure and culture of sputum not performed. Negative smear microscopy (54.8%) predominated among cases with negative HIV test, while positive smear microscopy (41.4%) predominated among the cases with positive HIV test (**Table 1**).

Table 1 - Tuberculosis cases reported in Maranhão State during the 2001-2011 period with regards to negative and positive HIV tests.

Variable	Anti-HIV Test	
	Negative n = 3864 (%)	Positive n = 689 (%)
Sex		
Female	1472 (38.1)	185 (26.8)
Male	2392 (61.9)	504 (73.2)
Age (years)		
< 19	377 (9.8)	45 (6.5)
20 to 39	1956 (50.6)	420 (61.0)
40 to 59	1011 (26.2)	180 (26.1)
≥ 60	520 (13.5)	44 (6.4)
Race/skin color		
White	724 (18.7)	156 (22.6)
Non-white	3140 (81.3)	533 (77.4)

Variable	Anti-HIV Test	
	Negative n = 3864 (%)	Positive n = 689 (%)
Schooling (years)		
> 8	1232 (31.9)	165 (23.9)
≤ 8	2632 (68.1)	524 (76.1)
Area		
Rural	765 (19.8)	135 (19.6)
Urbana	3097 (80.2)	554 (80.4)
Entry		
New case	3169 (82.0)	540 (78.4)
Retreatment	389 (10.1)	79 (11.5)
Transfer	306 (7.9)	70 (10.1)
Form		
Extrapulmonary	374 (9.7)	134 (19.4)
Pulmonary	3453 (89.4)	538 (78.1)
Pulmonary + extrapulmonary	37 (0.9)	17 (2.5)
Termination		
Cure	3039 (78.6)	453 (65.7)
Abandonment	403 (10.4)	84 (12.2)
Death	126 (3.3)	110 (16.0)
Failure	18 (0.5)	2 (0.3)
Transfer	278 (7.2)	40 (5.8)

Source:

From a gross data analysis, significant associations (p ≤ 0.05) for coinfection were male gender, age groups from 20 to 39 years old and from 40 to 59 years old, schooling less than 8 years old, entry by transfer and termination by abandonment death. In the adjusted analysis, male gender, age group from 20 to 39 years old, schooling less than 8 years old and termination due to abandonment/ death remained associated with coinfection. Non-white races and pulmonary clinical forms were protective factors in both analyzes, and age greater than or equal to 60 years old was a protective factor only in the adjusted analysis (**Table 2**).

Table 2 - Both gross and adjusted data analysis of factors associated with TB/HIV coinfection reported in Maranhão State, 2001-2011 timeframe.

Variable	TB/HIV coinfection			
	Gross PR* (CI 95%)	p	Adjusted PR (CI 95%)	p
Sex				
Female	1		1	
Male	1.55 (1.31 - 1.84)	< 0.001	1.46 (1.25 - 1.70)	< 0.001
Age (years)				
< 19	1		1	
20 to 39	1.65 (1.22 - 2.25)	0.001	1.55 (1.16 - 2.06)	0.003
40 to 59	1.41 (1.02 - 1.97)	0.036	1.23 (0.90 - 1.67)	0.178
≥ 60	0.73 (0.48 - 1.10)	0.140	0.58 (0.39 - 0.86)	0.007
Race/skin color				
White	1		1	
Non-white	0.82 (0.68 - 0.98)	0.028	0.77 (0.66 - 0.90)	0.001

Variable	TB/HIV coinfection			
	Gross PR* (CI 95%)	p	Adjusted PR (CI 95%)	p
Schooling (years)				
> 8	1		1	
≤ 8	1.40 (1.18 - 1.67)	< 0.001	1.49 (1.27 - 1.75)	< 0.001
Area				
Rural	1			
Urbana	1.01 (0.84 - 1.22)	0.886		
Entry				
New case	1		1	
Retreatment	1.15 (0.91 - 1.47)	0.219	1.10 (0.89 - 1.37)	0.365
Transfer	1.28 (1.00 - 1.64)	0.053	1.11 (0.89 - 1.38)	0.370
Form				
Extrapulmonary	1		1	
Pulmonary	0.51 (0.42 - 0.62)	< 0.001	0.53 (0.45 - 0.62)	< 0.001
Pulmonary + extrapulmonary	1.19 (0.72 - 1.97)	0.492	1.21 (0.83 - 1.76)	0.325
Termination				
Cure	1		1	
Abandonment	1.33 (1.05 - 1.68)	0.016	1.31 (1.06 - 1.64)	0.014
Death	3.59 (2.92 - 4.42)	< 0.001	3.19 (2.71 - 3.75)	< 0.001
Failure	0.77 (0.19 - 3.09)	0.713	0.82 (0.22 - 3.11)	0.774
Transfer	0.96 (0.70 - 1.34)	0.852	0.97 (0.72 - 1.31)	0.852

*PR = prevalence ratio.
Source:

The importance of epidemiological studies is justified by the possibility of better understanding the associations between diseases and sociodemographic variables and, thus, guiding the recognition of groups and situations of risk in order to better manage cases that fit into these categories. It is worth emphasizing the relevance of the knowledge of such associations by health professionals who, in the exercise of their profession, should be aware of these changes in order to adopt a biopsychosocial approach to health.

The results of this study revealed a prevalence of 15.1% of TB/HIV coinfection in the study population. This prevalence is below the national average of 23% registered in 2010, but above the percentages found in the States of *Piauí* and *São Paulo*.[6,10] Although this prevalence rate is below the national average, it is relevant since it is related to the increased contagion, treatment costs, morbidity and mortality, and treatment resistance.

The decrease in the amplitude between the maximum and minimum prevalence of HIV test positivity reflects the increase in the performance of the test in the State. A study carried out in *Mato Grosso do Sul* State pointed out that high prevalence of HIV test positivity results from the test offered in the Tuberculosis Programs.[11]

Since 2007 there was a decrease in the maximum prevalence and an increase in the minimum prevalence of HIV test positivity. Similar results were recorded[11] as a reflex of more patients tested. Although the records indicate an improvement in the supply of HIV testing, the percentage found in this study (65.9%) is below the recommended value.[4,7]

The predominance of men with coinfection confirms results from studies conducted in other cities in Brazil and the world.[4,12-3] Some authors point out that there are differences in the search for health services between men and women, and that men often neglect the self-care and also seek care later.[7,14]

The predominant age group was young adults, similar to other studies.[3,15] In this age group, it is not uncommon to adopt a lifestyle characterized by permissive behaviors and promiscuity, resulting in greater exposure to both disorders.[5] It was verified also that the age group of 60 years old or older presented a protective association for coinfection, which can be explained by a lower frequency of the two pathologies in this age group or by the possibility of underreporting in this group.[16]

The non-white race behaved as a protective factor for coinfection, contrary to findings from other studies.[8,17] In Maranhão, according to data from the National Survey per Household Sampling,[18] which was conducted in 2012, the predominant profile of the population has brown skin, which may have contributed to the finding.

The prevalence of low schooling confirms findings from other studies,[3,6] and reflects the fact that TB/HIV coinfection is a social problem. Low schooling may reflect unfavorable living conditions and, consequently, greater vulnerability.[5]

The pulmonary clinical form was more frequent, in agreement with other studies.[8,19] TB is a predominantly pulmonary disease,[20] which may explain the fact that it has behaved as a protective factor in the study.

Regarding the termination issue, a cure rate was found higher than the findings of another study.[8] Nonetheless, a significant association between coinfection and termination due to abandonment or death was detected. Neglecting the TB and HIV treatment is a multifactorial issue. Among the main causes are the occurrence of adverse effects, problems with therapeutic regimens, forgetfulness of doses, lack of motivation, anxiety about adverse effects and quantity of drugs.[21] The percentage of 16% of deaths found in the study serves as an alert, because it can be related to possible failures in care or to the detection of cases of coinfection.

The main limitations of this study were the lack of information and the occurrence of inconsistencies in the data. Nevertheless, such limitations did not compromise achievement of objectives. Despite the efforts of the Epidemiological Surveillance from the municipalities, it is known that the notification of the diseases is not yet satisfactorily performed.

CONCLUSION

It is concluded that the high prevalence of positive anti-HIV tests among tuberculosis patients in Maranhão State is related to low schooling, treatment abandonment and also death. This study may support action planning in order to control the two pathologies by understanding the multiplicity of associated factors.

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