

# ***Mycobacterium tuberculosis* and human immunodeficiency virus coinfection in a tertiary care hospital in Midwestern Brazil**

***Coinfezione da *Mycobacterium tuberculosis* e virus dell'immunodeficienza umana in un ospedale in Brasile centro-occidentale***

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## ■ INTRODUCTION

About one-third of the world population is infected with *Mycobacterium tuberculosis*. Coinfection with human immunodeficiency virus (HIV) may increase the risk of developing tuberculosis (TB) [1, 2]. The risk for TB is twice as high in the first two years of HIV infection [3].

HIV is not a risk factor for spread of TB in the general population; however, it may increase the incidence and severity of TB in immunocompromised individuals, with disseminated, extra-pulmonary and/or atypical forms [4].

This study aimed to characterize the clinical, radiographic and laboratory profile of TB/HIV-coinfected patients attending a Hospital for Tropical Diseases in the state of Goiás, Midwestern Brazil, between 2008 and 2009.

## ■ PATIENTS AND METHODS

This retrospective cohort study was conducted at a Hospital for Tropical Diseases in the state of Goiás, Midwestern Brazil, which is a reference center for cases involving complications or drug resistance in TB. The study was approved by the local Ethic Committee (Institutional Re-

view Board-equivalent) and was conducted in accordance with the provisions of the Declaration of Helsinki.

### *Patients*

Patients' medical records were reviewed between January 2008 and December 2009. All cases of TB/HIV coinfection diagnosed or reported in the institution were evaluated. HIV-seronegative TB patients were selected as controls (1 case: 1 control). Patients with a diagnosis of active pulmonary and/or extra-pulmonary TB based on clinical, radiographic and/or laboratory criteria, positive smear and/or culture or physician's decision to start TB treatment were included in the study. Smear was performed on sputum, pleural fluid, cerebrospinal fluid (CSF), urine, and synovial fluid. Inclusion criteria for HIV infection/AIDS were based on the criteria adopted by the Brazilian Ministry of Health [5]. Patients aged <18 years, pregnant women, nursing mothers and indigenous people were excluded from the study.

The matching criteria for the control group were: HIV serological status, year of TB diagnosis, sex, and age. Cure was defined as smear-negative after completion of TB treatment. Death from TB was considered as that occurring during TB treatment.

### Variables of interest

Information was collected on age, sex, weight, race, education level, date of HIV and/or TB diagnosis, and disease site (pulmonary or extrapulmonary TB). Laboratory variables included tuberculin skin test (TST), acid-fast bacilli (AFB) in sputum (or other biological sample), *M. tuberculosis* culture and sensitivity test, serum albumin, hemoglobin, total leukocyte count, CD4<sup>+</sup> and CD8<sup>+</sup> T lymphocyte levels, and HIV-1 viral load. Pulmonary radiographic findings and data on therapeutic regimen for HIV and/or TB (drug and start date) were also analyzed.

### Statistical analysis

Continuous variables were expressed as median, mean  $\pm$  standard deviation (SD) and categorical variables as count and percentage. Comparisons between groups were performed using Student *t* test for continuous variables and the chi-square test or Fisher's exact test for categorical variables. Data were analyzed using

EpiInfo<sup>®</sup> version 3.5.3 (CDC, Atlanta, Georgia). The level of significance was set at  $p < 0.05$ .

## RESULTS

In 2008/2009, 283 cases of TB were diagnosed or reported in the institution. Of these, 67 (23.6%) were TB/HIV-coinfected patients, 76 (26.8%) were HIV-seronegative TB patients, and 140 (49.4%) did not undergo HIV serological testing. Three TB/HIV-coinfected patients were excluded because their medical records were missing and three because of growth of non-tuberculosis mycobacteria on culture; 22 HIV-seronegative TB patients were excluded to match groups for sex and age. The final sample was composed of 61 TB/HIV-coinfected patients (study group) and 54 HIV-seronegative TB patients (controls).

The clinical characteristics of both groups are described in Table 1. The majority of patients

**Table 1** - Clinical characteristics of patients coinfecting with *Mycobacterium tuberculosis* and human immunodeficiency virus (HIV) and HIV-seronegative tuberculosis (TB) patients in a Hospital for Tropical Diseases in the state of Goiás, Midwestern Brazil - 2008/2009.

	TB/HIV-coinfected patients (n=61)	HIV-seronegative TB patients (n=54)	p
<b>Age* (years)</b>	37.1 (22-80)	40.1 (22-90)	0.20 <sup>†</sup>
<b>Sex, n. (%)</b>			
Female	15 (24.6)	8 (14.8)	0.14 <sup>‡</sup>
Male	46 (75.4)	46 (85.2)	
<b>Clinical forms of TB, n. (%)</b>			
Pulmonary	31 (50.8)	34 (63.0)	0.13 <sup>§</sup>
Disseminated	20 (32.8)	5 (9.3)	0.001 <sup>§</sup>
Pleuropulmonary	5 (8.0)	8 (14.8)	0.20 <sup>§</sup>
Lymph node	3 (4.9)	1 (1.9)	0.35 <sup>§</sup>
Central nervous system	1 (1.6)	5 (9.3)	0.07 <sup>§</sup>
Intestinal	1 (2.3)	0	0.53 <sup>§</sup>
Osseous	0	1 (1.9)	0.46 <sup>§</sup>
<b>Signs and symptoms, n. (%)</b>			
Fever of any duration	48 (78.6)	40 (74)	0.21 <sup>†</sup>
>3 weeks	33 (68.7)	34 (85)	0.23 <sup>†</sup>
Cough of any duration	42 (68.8)	45 (83.3)	0.03 <sup>†</sup>
>3 weeks	31 (73.8)	33 (73.3)	0.45 <sup>§</sup>
Dyspnea	29 (47.5)	31 (57.4)	0.10 <sup>†</sup>
Weight loss	40 (65.6)	44 (81.5)	0.02 <sup>†</sup>
Poor appetite	30 (49.2)	15 (27.8)	0.010 <sup>†</sup>
Diarrhea	21 (34.4)	1 (1.9)	0.000003 <sup>§</sup>
Oral moniliasis	17 (27.9)	3 (5.6)	0.001 <sup>§</sup>

\*Values expressed as median (minimum-maximum). <sup>†</sup>Student *t* test. <sup>‡</sup>Chi-square test. <sup>§</sup>Fisher's exact test.

**Table 2 - Outcomes of patients coinfecting with *Mycobacterium tuberculosis* and human immunodeficiency virus (HIV) and HIV-seronegative tuberculosis (TB) patients in a Hospital for Tropical Diseases in the state of Goiás, Midwestern Brazil - 2008/2009.**

	<i>TB/HIV- coinfecting patients (n=61)</i>	<i>HIV- seronegative TB patients (n=54)</i>	<i>p</i>
<b>Outcomes, n. (%)</b>			
Cure	23 (37.7)	27 (50)	0.09*
Death	24 (39.3)	10 (18.5)	0.007*
Dropout	8 (13.1)	6 (11.1)	0.37*
Transfer	4 (6.6)	7 (13)	0.19 <sup>†</sup>
Improvement	1 (1.6%)	4 (7.4)	0.14 <sup>†</sup>

\*Chi-square test; <sup>†</sup>Fisher's exact test

were men (75.4% in the study group and 85.2% in the control group).

Pulmonary TB was the clinical form of disease most frequently found in both groups, accounting for 56.5% of all cases. Disseminated TB was more common in coinfecting patients (OR 4.7; 95%CI 1.64-13.85). Clinical signs and symptoms were similar between groups, but poor appetite, diarrhea and oral moniliasis were significantly more frequent in the coinfecting group ( $p < 0.05$ ) (Table 1).

Mortality was higher in TB/HIV-coinfecting than in TB patients (OR 2.8; 95%CI 1.2-6.7) (Table 2). The mean age of patients who died was 39 years. However, when the coinfecting group was evaluated separately, most deaths occurred among patients aged around 34 years. Radiographic characteristics of both groups are described in Table 3. Chest radiography was performed in 55 (90.2%) coinfecting patients and 51 (94.4%) controls. The most common radiographic finding was bilateral infiltrates (51.8% in coinfecting and 51% in TB patients), corre-

sponding to interstitial (10 and 3.9%), alveolar (23.2 and 33.3%), or miliary (21.4 and 13.7%).

Table 4 describes laboratory findings for both groups. Regarding direct smear and culture tests, although higher positivity rates were observed in coinfecting patients, the difference was not statistically significant (OR 1.76; 95%CI 0.64-4.81). Tests for sensitivity to anti-tuberculo-static agents were performed only in one (1.7%) TB/HIV-coinfecting patient and five (9.3%) TB patients. There was one case of isoniazid resistance in the TB group.

Of 16/25 (64%) TST-positive coinfecting patients, four had active TB and started treatment: one patient dropped out after two months and died; one was at critical condition at admission and died after three days of treatment; and two underwent a six-month treatment and were cured. Twelve TST-positive coinfecting patients had latent TB; of these, four did not start treatment and developed the disease about six months after testing: two died, one worsened, and one was cured after a six-month treatment.

**Table 3 - Radiographic characteristics of patients coinfecting with *Mycobacterium tuberculosis* and human immunodeficiency virus (HIV) and HIV-seronegative tuberculosis (TB) patients in a Hospital for Tropical Diseases in the state of Goiás, Midwestern Brazil - 2008/2009.**

	<i>TB/HIV- coinfecting patients (n=61)</i>	<i>HIV-seronegative TB patients (n=54)</i>	<i>p</i>
<b>Chest radiography, n. (%)</b>			
Bilateral infiltrate	17/55 (51.8)	18/51 (51)	0.46*
Unilateral infiltrate	9/55 (16.1)	15/51 (29.4)	0.053*
Pleural effusion	6/55 (15)	6/51 (15.8)	0.31*
Normal	10/55 (17.9)	5/51 (9.8)	0.17 <sup>†</sup>
<b>Cavitary disease, n. (%)</b>			
Yes	3/55 (5.4)	11/51 (21.6)	0.013 <sup>†</sup>
No	53/55 (94.6)	40/51 (78.4)	

\*Chi-square test; <sup>†</sup>Fisher's exact test

Of 8/12 coinfecting patients who started treatment for latent TB, five completed treatment (two were cured, one improved, and one worsened) and three did not complete treatment (one died, one dropped out, and one was cured after a six-month treatment).

Complete blood count (CBC) was not performed only in two TB patients. Hematocrit and hemoglobin levels were significantly lower

in coinfecting patients (OR 5.82; 95% CI 2.58-13). Leukocytosis was more prevalent in TB patients (15.3 vs 32.1% in coinfecting patients) (OR 2.6; 95% CI 1.05-6.5) (Table 4).

The number of hospitalizations was higher among coinfecting patients: 24 coinfecting and 12 TB patients were admitted two or more times (OR 0.45; 95% CI 0.19-1.02; p=0.02) (Table 5). Mean length of hospital stay was 31.2 days (0-

**Table 4** - Laboratory characteristics of patients coinfecting with *Mycobacterium tuberculosis* and human immunodeficiency virus (HIV) and HIV-seronegative tuberculosis (TB) patients in a Hospital for Tropical Diseases in the state of Goiás, Midwestern Brazil - 2008/2009.

	TB/HIV-coinfecting patients (n=61)	HIV-seronegative TB patients (n=54)	P
<b>Smear (AFB), n. (%)</b>			
Positive	41/56 (73.2)	40/50 (80)	0.21*
Negative	8/56 (26.8)	8/50 (20)	
<b>M. tuberculosis culture, n. (%)</b>			
Positive	18/46(39.1)	8/30(26.7)	0.13*
Negative	28/46 (60.9)	22/30 (73.3)	
<b>TST, n (%)</b>			
Positive	16/25 (64)	7/13 (50)	0.20*
Negative	9/25 (37.5)	7/13(50)	
<b>Albumin (g/dL), n. (%)</b>			
<3.5	37/42 (88.1)	28/36 (77.8)	0.18†
>3.5	5/42 (11.9)	8/36 (22.2)	
<b>Hematocrit (%), n. (%)</b>			
<30	44/61 (73.3)	17/52 (30.2)	0.000006*
>31	16/61 (26.7)	36/52 (69.8)	
<b>Hemoglobin (g/dL), n. (%)</b>			
<10	44/61 (71.7)	17/52 (32.1)	0.000006
>11	16/61 (28.3)	36/52 (67.9)	
<b>Leukocytes (µL), n. (%)</b>			
<3,500	8/59 (13.6)	4/53 (7.5)	0.23†
3,501-11,999	42/59 (69)	32/53 (66.7)	
>12,000	9/59 (15.3)	17/53 (32.1)	0.01*

AFB = acid-fast bacilli; TST = tuberculin skin test. \*Chi-square test. †Fisher's exact test

**Table 5** - Number of hospitalizations of patients coinfecting with *Mycobacterium tuberculosis* and human immunodeficiency virus (HIV) and HIV-seronegative tuberculosis (TB) patients in a Hospital for Tropical Diseases in the state of Goiás, Midwestern Brazil - 2008/2009.

	TB/HIV-coinfecting patients (n=61)	HIV-seronegative TB patients (n=54)	p
<b>Number of hospitalizations, n. (%)</b>			
0-1	26 (60.5)	32 (80)	0.05*
>2	17 (39.5)	8 (20)	

\*Student t test.

111 days) for coinfecting and 20.9 days (0-80 days) for TB patients, with a statistically significant difference between groups ( $p=0.033$ ).

This study evaluated CD4<sup>+</sup> T lymphocyte levels only in TB/HIV-coinfecting patients, and 81.9% of these patients had these data recorded at the time of TB diagnosis. Mean CD4 count was 175 cells/mm<sup>3</sup> (7 to 912 cells/mm<sup>3</sup>; SD=204.3). Mean CD8 count was 706.21 cells/mm<sup>3</sup>, ranging from 370 to 2,559 cells/mm<sup>3</sup>. A total of 40/50 (80%) patients had CD4 <200 cells/mm<sup>3</sup>, and only 10 (20%) had CD4 counts above this value. Only 7/50 (14%) patients had CD4 >350 cells/mm<sup>3</sup>, which is the level currently recommended in the Manual of Recommendations for TB Control in Brazil to start antiretroviral therapy (ART) [1].

Extrapulmonary TB was the most frequent clinical form of the disease in coinfecting patients with CD4 <200 cells/mm<sup>3</sup> - 21 (52.5%) vs. 19 (47.5%) pulmonary TB cases - compared to coinfecting patients with CD4 >201 cells/mm<sup>3</sup> - 2 (20%) vs. 8 (80%) pulmonary TB cases (OR 4.4; 95%CI 0.8-23.4). Considering the cutoff point of CD4 <350 cells/mm<sup>3</sup>, pulmonary TB (23 cases) was the most frequent clinical form of the disease, followed by disseminated (15 cases), lymph node and pleural (2 cases each), and neurotuberculosis (only 1 case). In patients with CD4 >350 cells/mm<sup>3</sup>, there were 5 cases of pulmonary TB and 1 case of lymph node TB.

There was no significant difference in signs and symptoms between groups stratified by CD4 (CD4 <200 vs >201 cells/mm<sup>3</sup>).

Of 44 coinfecting patients with anemia (hematocrit <30% and/or hemoglobin <10 g/dL), 34 had CD4 <350 cells/mm<sup>3</sup> (OR 6.8; 95%CI 1.08-42.7).

Of 47 coinfecting patients who underwent measurement of plasma HIV viral load, 78.7% had levels above 400 copies/μL (mean of 100,681 copies/μL). Also, 83.8% of patients with CD4 <200 cells/mm<sup>3</sup> had plasma HIV viral load above 400 copies/μL.

Of 13 coinfecting patients with a concurrent diagnosis of TB/HIV, nine were on advanced immunosuppression (CD4 levels <200 cells/mm<sup>3</sup>), three did not undergo this test, eight died (62%), and five (38%) were cured. Of 42 patients with a diagnosis of TB after HIV, 27 (75%) were on advanced immunosuppression (CD4 levels <200 cells/mm<sup>3</sup>), 16 (38%) were cured, eight dropped out, three were transferred, one improved, and 14 (33%) died. Six patients had a diagnosis of TB before HIV, four were on ad-

vanced immunosuppression, two were cured and two died.

Forty-eight coinfecting patients used ART; of these, 26 were diagnosed with TB after starting ART (from one month to 12 years, mean of 12 months). Of eight patients who started treatment within the first three months of ART, 50% died; of 18 patients who started treatment after the first three months of ART, only three (16.7%) died (OR 0.13; 95%CI 0.01-1.009;  $p=0.059$ ). Twenty-two (36%) patients were diagnosed with TB before starting ART, seven (31%) started using antiretrovirals in the first month of TB treatment and 15 (69%) after the first month, with no significant difference in mortality rates among these patients. Of 13 patients who did not start ART, four had CD4 levels below and one above 200 cells/mm<sup>3</sup>; the remaining patients did not undergo this test. Death rate in this group was 92.3%.

Of eight coinfecting patients who dropped out from TB treatment, only one was female. In the TB group, all seven dropouts were male. The mean age of dropouts was 35 years in the coinfecting and 33 years in the TB group.

## DISCUSSION

Prevalence of TB/HIV-coinfecting patients in 2008/2009 was 23% in the institution studied here. Coinfection was more prevalent in men (75.4%), with mean age of 37.1 years. The mortality rate was 2.8 times higher in TB/HIV-coinfecting patients (39.3%) than in TB patients without HIV (18.5%).

TB can affect HIV-infected patients at any time during the course of their disease. However, in the presence of severe immunosuppression, TB can develop in unusual forms, sub-clinically or as a normal chest radiograph. TB/HIV-coinfecting patients tend to have worse clinical and laboratory conditions than HIV-seronegative TB patients [6-9].

Our findings were consistent with the literature on the prevalence of men among TB and TB/HIV-coinfecting patients in Brazil [10, 11]. Data from the Brazilian Information System for Notifiable Diseases (SINAN) confirm this trend in the state of Goiás [12]. International studies have also confirmed this prevalence [13-15]. In their institutions, Sabbatani et al. and Scotto et al. found coinfection's rates of 33,1% and 9,9%, respectively [14, 15]. A male predominance in TB cases may be explained by a greater expo-

sure of men to the disease, due to male behavioral characteristics, and/or because of a greater difficulty of men in adhering to treatment.

Most patients in both groups were aged between 35 and 40 years, in accordance with previous studies and SINAN data [11, 12, 16]. This age range corresponds to the individual's most productive years, thus negatively affecting individuals socially and economically, as well as the family and society as a whole.

In this study, pulmonary TB was the most common clinical form of the disease (56.5%). Extrapulmonary TB showed a greater number of cases in the coinfecting group (30 cases), which is consistent with the literature [9].

Disseminated TB was the second most common form among coinfecting patients, accounting for 32.8% of cases; however, it was not associated with mortality. Bendayan et al. found disseminated disease in 18% of their coinfecting patients [9]. Klautau & Kuschnaroff found a higher frequency of disseminated TB and deaths, as well as Clevenbergh et al., who reported high prevalence of disseminated disease [17, 18].

In Goiás, over the past five years, pulmonary TB has been the most frequent form of TB in the general population, accounting for about 81% of cases in 2008 and 82.8% of cases in 2009 [12]. In a study by Sabbatani et al., lymph node tuberculosis was related to HIV, while the lungs and pleura were the sites most frequently found in HIV-negative patients [14].

The most common symptoms found in our TB/HIV-coinfecting patients are consistent with those reported by Cain et al. with fever, cough, weight loss and poor appetite standing as important clinical symptoms to be considered in the diagnosis of TB [19].

As in the case report of Franco et al., the patient reported fever and cough for more than two months [20].

TST should be performed annually in patients with HIV/AIDS, according to the recommendations of the Brazilian Ministry of Health and international guidelines [1, 21]. However, TST was performed only in 25 (40%) patients with HIV/AIDS at the institution, and 4 patients had TB at the time of testing.

Moreover, in the presence of a positive TST, chemoprophylaxis should be introduced immediately; however, only 66% of patients had chemoprophylaxis. Only 41% of these patients completed chemoprophylaxis, which favored the development of the disease and death from TB in this population.

Bilateral pulmonary disease was the most common radiographic finding in both groups (51.8%). The institution receives severe TB patients for treatment of complications, which may explain why the typical pattern of unilateral upper lobe infiltrate was not the most prevalent in the TB group.

Cavitary disease was found only in three coinfecting patients, and two of them had CD4 >200 cells/mm<sup>3</sup>, corroborating data from Klautau & Kuschnaroff [18].

AFB testing showed good sensitivity, with mean positivity rates of 76% in both groups, unlike the study by Cain et al., in which a few coinfecting patients had positive results [20]. In the study by Clevenbergh et al., most patients had smear- and culture-positive specimens [19]. Positive culture for *M. tuberculosis* was 1.4 times higher in coinfecting patients, highlighting the importance of this test in patients with HIV/AIDS. Bendayan et al. found 61% positivity in the culture for *M. tuberculosis* [9]. Culture testing was less requested in the TB group, because the Brazilian Ministry of Health does not recommend it as a routine test for the diagnosis of TB in the general population [1].

Coinfecting patients had higher frequency of anemia (hemoglobin <10 g/dL and/or hematocrit <30%), with a six times greater risk (OR 6.35) than TB patients, but with no association with death.

Mugussi et al. identified low hemoglobin as a factor associated with mortality [6]. Van Rie et al. identified anemia as a risk factor for incidence of TB in patients receiving highly active ART (HAART), both in early (<six months) and late (>six months) incidence in relation to the start of HAART [7].

Albumin <3.4 g/dL was prevalent in both groups, found in about 70% of patients. These data reveal that patients often come to the institution in a state of malnutrition. Chronic disease may cause malnutrition, and when it is associated with poor nutrition, the patient's condition worsens.

In this study, TB cure rate in coinfecting patients was 37.7%, below the 62.3% cure rate described by Lacerda et al. [10]. However, Prado et al. found a 48.5% cure rate in TB/HIV-coinfecting patients in the state of Espírito Santo, Southeastern Brazil [22].

Clevenbergh et al. found a treatment dropout rate of 20% in coinfecting patients, whereas Klautau & Kuschnaroff found a dropout rate of 11% [19, 18]. Lacerda et al. reported a 23.4%

dropout rate [10]. We found a 13% treatment dropout rate in coinfecting patients, which is within the observed patterns.

In this study, mortality was high among coinfecting (39.3%) and TB (18.5%) patients, resulting in a 2.8 times greater risk of dying in the coinfecting group. Most coinfecting patients (80%) had advanced immunosuppression (CD4 <200 cells/mm<sup>3</sup>) at diagnosis of TB, which contributed to an unfavorable outcome.

No association was found between CD4 levels and other variables, probably due to the small number of patients with CD4 >200 cells/mm<sup>3</sup> (10 patients) compared to 40 with CD4 <200 cells/mm<sup>3</sup>, thus hindering a reliable statistical analysis. Prado et al. reported that 28.8% of coinfecting patients died. In a meta-analysis by Straetemans et al. HIV-positive patients with TB were 1.8 times more likely to die than those without TB [22, 23].

Some complicating factors associated with patient care were noted in the institution studied here. We found errors in the completion of medical records, such as missing data on weight and height at diagnosis, and 49% of TB patients diagnosed in the institution did not undergo HIV serological testing. Several patients dropped out from TB treatment, and the hospital does not seem to have an effective strategy to track these patients. In addition, given the current knowledge on the subject, we question whether a six-month period is enough to consider TB cases, with or without HIV coinfection, as closed.

TB is a fully controllable disease, but it may achieve high severity and mortality in individ-

uals with HIV/AIDS. Thus, actions to improve the diagnosis and ensure treatment compliance, based on national and international recommendations, may contribute to the improvement in cure rates and TB and HIV/AIDS prognosis in the institution.

Based on these results, we recommend that TST should be performed at the time of HIV diagnosis and annually thereafter for the early diagnosis and treatment of latent TB. Also, culture for *M. tuberculosis* and sensitivity tests should be performed, regardless of symptoms, in TST-positive patients with HIV/AIDS who have a long history of HIV infection and low CD4 count. It is important to follow the guidelines of the Manual of Recommendations for TB Control in Brazil which recommends to increase the duration of latent TB treatment in coinfecting patients from six to nine months, in addition to requesting culture and sensitivity testing for all coinfecting patients at the time of diagnosis of TB [1]. The use of modern techniques such PCR on BAL allows to diagnose TB and drug-resistant more rapidly than using cultural examination of sputum; unfortunately this techniques are not routinely used in Brazil [14]. HIV testing should be requested for all TB patients at diagnosis. Finally, further cohort studies investigating the profile of TB/HIV-coinfecting patients are warranted to provide more precise information on risk factors.

**Keywords:** Acquired Immunodeficiency Syndrome, HIV, *Mycobacterium tuberculosis*, tuberculosis.

## SUMMARY

Infection with human immunodeficiency virus (HIV) increases the risk of tuberculosis (TB), and HIV/TB coinfection is associated with higher mortality. This study aimed to characterize patients coinfecting with *Mycobacterium tuberculosis* and HIV in a reference centre for cases involving complications or drug resistance in TB. This retrospective cohort study was conducted at a Hospital for Tropical Diseases in the state of Goiás, Midwestern Brazil. Patients' medical records were reviewed between January 2008 and December 2009. Sixty-one cases of TB/HIV coinfection were evaluated, and 54 HIV-seronegative TB cases were selected as controls. The prevalence of TB/HIV-coinfecting patients in 2008/2009 was 23%. Coinfection was more prevalent in men (75.4%), with a

mean age of 37.1 years. Pulmonary disease (50.8%) was the most frequent clinical form of TB in coinfecting patients, followed by disseminated disease (32.8%). Anaemia, malnutrition and low levels of CD4 T lymphocytes were found in about 80% of coinfecting patients. Bilateral pulmonary infiltrates were the most common radiographic finding in coinfecting patients (51.8%), and pulmonary cavitation was the rarest event (5.4%). The mortality rate was 2.8 times higher in the TB/HIV-coinfecting group (39.3%) than in TB patients without HIV (18.5%). Actions targeting the TB/HIV-coinfecting population, based on national and international recommendations, are necessary to improve prognosis and outcomes in TB and HIV infection in the institution.

## RIASSUNTO

L'infezione da virus dell'immunodeficienza umana (HIV) aumenta il rischio di tubercolosi (TB), e questa coinfezione è associata a più elevata mortalità.

Questo studio è stato condotto al fine di caratterizzare i pazienti con coinfezione da *Mycobacterium tuberculosis* e HIV in un centro di riferimento per i casi più complicati e/o caratterizzati da resistenza ai farmaci antitubercolari.

Questo studio di coorte retrospettivo è stato condotto in un ospedale per le malattie tropicali nello stato del Goiás, in Brasile centro-occidentale.

L'esame delle cartelle cliniche dei pazienti è stato effettuato nel periodo compreso tra gennaio 2008 e dicembre 2009.

Complessivamente, sono stati valutati sessantuno casi di coinfezione TB/HIV mentre 54 casi di pazienti TB positivi e HIV-sieronegativi sono stati selezionati come controlli.

Nel periodo considerato, la prevalenza di pazienti con coinfezione TB/HIV è stata pari al 23%, con percentua-

li maggiori nel sesso maschile (75,4%), con un'età media di 37,1 anni. La localizzazione polmonare (50,8%) ha rappresentato la forma clinica più frequente di TB nei pazienti con coinfezione, seguita dalla malattia disseminata (32,8%).

Anemia, malnutrizione e bassi livelli di linfociti T CD4 sono stati riscontrati in circa l'80% dei pazienti TB/HIV-coinfetti.

Nei pazienti con coinfezione, il dato radiologico più comune era rappresentato dagli infiltrati polmonari bilaterali (51,8%), quello più raro dalla cavitazione polmonare (5,4%). Nel gruppo di pazienti con coinfezione TB/HIV, il tasso di mortalità è risultato di 2,8 volte superiore (39,3%) rispetto a quello dei pazienti affetti solo da TB (18,5%).

Gli autori sottolineano la necessità di implementare, nell'ospedale in studio, interventi mirati alla popolazione di pazienti con coinfezione TB/HIV, in accordo alle raccomandazioni nazionali e internazionali, al fine di migliorare la prognosi e gli esiti di tali pazienti.

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