Clinical and Environmental Factors Associated with Pulmonary Tuberculosis in Prisoners in Northeastern Brazil

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Abstract

This study aimed to assess clinical and environmental factors associated with pulmonary tuberculosis in prisoners. We carried out a documentary, retrospective, epidemiological study of records of tuberculosis cases in a prison hospital in Northeastern Brazil. The sample consisted of data from medical records of prisoners diagnosed with TB from January 2015 to January 2016. Information such as age, race, marital status, education level, weight, height, harmful habits, and clinical data on mucous membrane, cough, sputum, breathing pattern, bacilloscopy, initiation and type of treatment, treatment duration, prison of origin and time spent in prison were assessed. A total of 109 medical records of prisoners were analyzed. Mean age was 28.5 (± 7.9) years, and most prisoners (n=87; 79.8%) were single. In all, 78.0%

(n=85) of the prisoners had primary education and 73.4% (n=80) were self-declared *Pardos* (mixed-race Brazilians). Statistically significant associations were found between level of education and prevalence of cough (p=.042), time in prison and presence of cough (p=.014), and BMI and mucous membrane coloration (p=.001). The habits of most prisoners are different from those expected for a good quality of life. In addition, the health conditions of prisoners also contribute to the infection. These findings emphasize the need for actions targeted at eliminating tuberculosis in prisoners and actions to raise awareness about hygiene and life habits.

Keywords: Tuberculosis; Tuberculosis in Prisons; Epidemiology; Cough

Introduction

Pulmonary tuberculosis (TB) is still a major public health problem worldwide. In 2015, 10.4 million people fell ill with TB and 1.8 million died from the disease. Over 95% of TB deaths occur in low- and middle-income countries, including Brazil (World Health Organization [WHO], 2016).

Official data from Brazil show that there were 73,000 new cases of pulmonary tuberculosis (TB) between 2005 and 2014, with 4,577 deaths in 2013 (Brasil, 2015). Within this context, Brazil ranks 16th in number of TB cases among the 22 high-burden countries that account for over 80% of the world's TB cases. The TB incidence rate estimated for 2015 in Brazil was 84/100,000 inhabitants (WHO, 2016).

Tuberculosis in prisons is a major challenge to TB control. Eliminating TB in prisons is complex and depends on other aspects of both the health and criminal justice systems, and the cultural, historical, and economic situations of each country (Dara et al., 2015).

In recent years, there has been an increase in Pulmonary Tuberculosis (TB) in prisons in both developed and developing countries (Baussano et al., 2010). The prevalence of TB in prisons is up to 100 times higher than that of the civilian population in both low- and high-income countries (WHO, 2014). Therefore, the occurrence of TB in prisons has a significant relevance for public health, particularly in Brazil, where incarceration rates continue to grow (Brasil, 2014a).

In the State of Ceará, located in Northeastern Brazil, 3.4% of a population of 620,000 inhabitants were incarcerated in 2014, which corresponds to a prison population of 21,000 inmates and an increase of 67% compared with the year 2008 (Secretaria Estadual de Justiça do Ceará, 2014). In addition to overcrowding, prisons lack hygiene and infection control, which makes inmates vulnerable to infectious diseases (Sarang, Platt, Vyshemirska, & Rhodes, 2016). The latest data from the Ceará Correctional System Coordination Office have reported a total of 24,472 prisoners in the state (Secretaria Estadual de Justiça do Ceará, 2016).

TB diagnosis includes some fundamental procedures, such as radiological, serological, biochemical, histological, pathological, bacteriological and tuberculin tests. Clinical examination should check for cough, sputum and weight loss, which are the most common symptoms. Importantly, a positive sputum culture is proof for infection (Ryu, 2015).

Given that, the present research aimed to assess clinical and environmental factors associated with pulmonary tuberculosis in prisoners.

Material and Methods

This is a quantitative retrospective epidemiological study that carried out a documentary analysis of medical records of prisoners diagnosed with tuberculosis. The study was conducted from February to April 2017 at the Professor Otávio Lobo Prison Hospital and Sanatorium, located in the municipality of Itaitinga, state of Ceará, Northeastern Brazil. The hospital is a reference in the male correctional system of the state and opened in 1968.

The sample consisted of data from medical records of prisoners diagnosed with TB from January 2015 to January 2016. Information such as age, race, marital status, education level, weight, height, harmful habits, and clinical data on mucous membrane, cough, sputum, breathing pattern, bacilloscopy, initiation and type of treatment, treatment duration, prison of origin and time spent in prison were assessed.

The information collected were initially organized in an Excel spreadsheet and later analyzed using the Statistical Package for the Social Sciences for Windows (SPSS Inc. Chicago, IL, USA), version 22.0. Categorical variables are described as absolute and relative frequencies and mean, median, standard deviation, and minimum and maximum values. The Chi-squared test and Fisher's Exact Test were used to check for associations between categorical variables. P-value was set at $p<0.05$.

The study is part of a larger research project entitled "Prison Health: the reality of a prison in the State of Ceará", which was approved by the Research Ethics Committee of the Faculdade Metropolitana da Grande Fortaleza – FAMETRO under Approval No. 1.937.168. Written informed consent was obtained from the legal representative responsible for the patients' medical records.

Results

A total of 109 medical records of prisoners admitted to the prison hospital were analyzed. Age ranged 18 to 58 years, with a mean of 28.5 (±7.9) years.

Ages 18 to 29 years (72; 66.1%) and single individuals (89; 81.7%) predominated. Most of the prisoners had 1 to 5 years of study (56; 51.4%), 80 (73.4%) were self-declared *Pardos* (Mixed-race Brazilians), 55 (50.5%) were underweight, and 46 (42.2%) had been in prison for 1-3 years.

After the diagnosis of tuberculosis, the treatment took on average 13.4 (±53.5) days to be started, and the result of the sputum smear examination for control took an average of 43.2 (±93.0) days.

According to data from the records, 76 (69.7%) of the prisoners had pale mucous membranes, 105 (96.3%) presented with cough, 91 (83.5) had sputum production, 93 (85.3%) had positive bacilloscopy, and only 12 (11.0%) had normal breathing pattern.

The bivariate analysis of health conditions (presence of pale mucous membranes, cough, sputum, breathing pattern, and positive Bacilloscopy) detected statistically significant association of positive Bacilloscopy with age group (p=0.042) and time spent in prison (p=0.028). In addition, Body Mass Index (BMI) was associated with pale mucous membranes (p=0.009), cough (p=0.026) and sputum production (p=0.046).

Table 1 describes the analysis of the association between the characteristics of the medical records of prisoners following treatment for TB and their sociodemographic characteristics (Table 1).

Table 2 describes data on harmful habits (smoking, alcohol, illicit drug use). In all, 70 (64.2%) prisoners reported smoking, 35 (32.1%) reported drinking, and 29 (26.6%) reported using illicit drugs. There was a statistically significant association between drinking and sputum production (p=0.037) (Table 2).

Discussion

Tuberculosis is a major health problem in prisons and it can generate costs to both the prison and health care systems. Thus, it is important to identify the main risk factors for TB in prisoners in order to prevent its onsent and spread. If proper attention is given to the risk factors for TB, especially in the more susceptible populations, such as prisoners, such a major health problem may be more easily prevented. Therefore, the present study provides evidence on the risk factors for TB in prisoners that can assist policy makers in the development of actions to tackle TB in prisons.

About 607,731 people are in prison in Brazil. One of the concerns with this population group is related to the health of these individuals, mainly with regard to Tuberculosis (Negreiros & Vieira, 2017). The growing epidemic of tuberculosis in prisons is associated with the lack of effective control of tuberculosis within these institutions, such as late diagnosis and failure to isolate prisoners with symptoms or suspected TB and failure to provide treatment (Souza et al., 2012). Thus, poor hygiene conditions, greater physical contact between prisoners and high rates of TB in prisons demonstrate the need for constant epidemiological surveillance among incarcerated population groups in order to determine the health indicators and vulnerability factors in prison populations.

In the present study, the mean age of infection was 28.5 years, which is consistent with other studies that confirm that highest tuberculosis rates are found in people aged 20-30 years (Owokuhaisa, Thokerunga, & Bazira, 2014).

The mean age found in the present study is similar to that found by Alarcón-Robayo et al. (2016) in a study carried out in ten prisons in Colombia, where the mean age found was 27 years. However, such condition may vary across countries and regions. For instance, research carried out in South Africa shows that 52% of inmates with TB were aged 31–40 years (Nyasulu, Mogoere, Umanah, & Setswe, 2015).

In our research, 73.4% of the prisoners with tuberculosis had only elementary education. This fact corroborates the pattern found in the Brazilian prison population (Brasil, 2014b). These findings confirm that, in addition to being in prison, people with low levels of education are more likely to be infected with TB – most of the prisoners (78%) had only one to nine years of study, and more than half of these (51.4%) had only one to five years of study. Thus, these factors synergistically disadvantage imprisoned people compared with the general population (Jones, Craig, Valway, Woodley, & Schaffner, 1999).

Most of the prisoners analyzed in our study (73.4%) declared themselves to be *Pardos* (Mixed-race Brazilians). This race was also predominant in a study conducted in the city of São Luís, Northeastern Brazil (Câmara et al., 2016).

Research on the risk factors for TB in prisoners has highlighted malnutrition (Kalonji et al., 2016). This finding is consistent with the statistically significant association between underweight and epidemiological characteristics of prisoners with TB (presence of pale mucosa p=0.009, cough p=0.023, and sputum production p=0.046) in the present study.

The symptoms presented by most of the prisoners are consistent with the symptoms of tuberculosis, although most of them have presented with normal breathing pattern (89%). It should be noted, however, that TB is not always accompanied by changes in breathing patterns (Ferreira et al., 2005). Although coughing had low yields in tuberculosis screening (Valença, Cezar-Vaz, Brum, & Almeida da Silva, 2016), the statistically significant association between cough (p=0.026) and underweight in prisoners is corroborated by a study in which 68.8% of the prisoners interviewed presented with cough lasting 2 or more weeks and 40.7% reported weight loss (Owokuhaisa, Thokerunga, & Bazira, 2014).

Time spent in prison is one of the factors that predisposes the prisoner to have tuberculosis (Silva Junior, 2004). In this regard, the longer the time in prison, specifically more than 12 months of imprisonment, the greater the chances of developing tuberculosis symptoms (Valença, Possuelo, Cezar-Vaz, & Almeida da Silva, 2016). In the present study, 96.4% of the inmates who had been in prison for more than five years presented positive bacilloscopy (p=0.028). These are the most cited symptoms in previous studies (Nogueira & Abrahão, 2009; WHO, 2000).

Secretion with blood seldom occurs in cases of *Mycobacterium tuberculosis* infection (Silva Junior, 2004). This finding is in agreement with that of the present study. According to data from the medical records, tuberculosis was diagnosed using smear microscopy and x-ray, the latter being a complementary examination. The majority (85.3%) of the prisoners tested positive and began the treatment right away. The time spent between diagnosis and the beginning of treatment was on average 13 days. In a study carried out in a prison in Rio Grande do Sul, the time taken to start treatment was on average 24 hours after the diagnostic confirmation (Valença, Possuelo, Cezar-Vaz, & Almeida da Silva, 2016). Another study has shown that inmates who tested negative (sputum smear and x-ray) also received anti-tuberculosis therapy as a form of chemoprophylaxis, as this process can prevent possible contamination of healthy prisoners (Aerts et al., 2000).

According to the World Health Organization (Oliveira et al., 2014), the BMI of most prisoners (56.8%) is within the range of 18.5 to 24.9 (kg/m^2), which indicates that the individual is at normal weight. In another study, weight loss and lack of appetite were observed in only 3.2% of prisoner. On the other hand, in some Colombian prisons, weight loss was found in 16.8% of prison inmates with tuberculosis (Alarcón-Robayo et al., 2013).

In the present, half of the inmates were underweight (50.5%) and there was a statistically significant association of BMI reduction with pale mucosa (p=0.009), cough (p=0.026) and sputum (p=0.046). One of the signs observed in the patients was the pale mucosa, which may be related to xerostomia, that is, insufficient production of saliva. Xerostomia can have a subjective etiology, without evidence of alteration as to the salivary flow (Fávaro, Ferreira, & Martins, 2006). In this case, this sign may be associated with psychological factors, since deprivation of freedom entails mental problems (Valença, Possuelo, Cezar-Vaz, & Almeida da Silva, 2016).

Another important issue that should be highlighted is the fact that most of the inmates with TB were smokers (64.2%). Although there was no statistically significant association between harmful habits and TB, the high percentage of inmates who reported harmful habits and presented with cough, sputum production and positive bacilloscopy should be highlighted. Importantly, all the inmates were receiving hospital treatment, which may certainly have influenced such causality.

Smoking is considered a potential risk factor for pulmonary infections, including tuberculosis, since cigarette smoke promotes the reduction of mucociliary clearance of the respiratory tract, increasing the adherence of bacteria and breaking the protective epithelium (Rabahi, 2012). It has also been demonstrated that life habits prior to imprisonment are important factors for the diagnosis and treatment of tuberculosis (Severo, Leite, Capela, & Simões, 2007).

Although most of the inmates were not drinkers, almost all of those who reported drinking (35; 32.1%) presented with sputum production, with a statistically significant association between these variables (p= 0.037).

Use of illicit drugs was reported by 26.6% of the inmates, but it was not significantly associated with other variables. However, all the inmates who reported using illicit drugs presented with cough and nearly all the inmates who reported using illicit drugs presented with pale mucosa, sputum production and positive bacilloscopy.

Illicit drug users constitute a group at high risk for tuberculosis and other diseases. The physiological effects of drug use, along with the environment and risk behaviors of drug users, may contribute to the high prevalence of TB among drug users, thus demonstrating the importance of strategies for TB control among drug users, particularly when it can be combined with drug rehabilitation (Deiss, Rodwell, & Garfein, 2009).

The present study showed that TB is more prevalent in younger age groups and lower BMI in imprisoned individuals. These findings suggest that TB in prisoners may be associated with the living habits they have been exposed to.

It is known that the architecture of prisons and the general living conditions in these facilities increase the risk for TB. In addition, the time spent in prison increases exposure to such conditions and therefore to TB, which is also influenced by illicit drug use (Nyasulu et al., 2015).

These findings emphasize the need for actions within the prisons aimed at tracing inmates with the characteristics presented in the present study. Also, there should be actions to raise awareness of the importance of hygiene and living habits of prisoners and the community in order to minimize damage to physical and psychological health. After all, these prisoners are not totally restrained from the bond with the community, since they receive visits and have direct contact with penitentiary agents and health professionals.

It should be noted that only one single prison was included in the present research, which prevents its results from being extrapolated, thus constituting a limitation of the present study. However, the study was conducted in a large prison hospital in Northeastern Brazil; therefore, its results may also be found in other prisons and hence allow the measurement of the impact of TB in addition to serving as a basis for improving public health care policies targeted at prison populations.

Thus, although the present study is limited to one single large prison hospital, it is expected to draw attention to the magnitude of the problem and the need for further research on the issue globally.

Conclusion

TB is more prevalent in younger age groups and lower BMI in imprisoned individuals. These findings suggest that TB in prisoners may be associated with the living habits they have been exposed to. In addition, the time spent in prison increases exposure to such conditions and therefore to TB, which is also influenced by illicit drug use.

It should be noted that prison time was a relevant factor for acquiring the disease and that the majority of the inmates presented with cough, weight loss, smoking, pale mucosa and clinically altered secretion.

The habits of most prisoners are different from those expected for a good quality of life. In addition, the health conditions of prisoners also contribute to the infection. These findings emphasize the need for actions targeted at eliminating tuberculosis in prisoners and actions to raise awareness about hygiene and life habits.

References

[1] Aerts, A., Habouzit, M., Mschiladze, L., Malakmadze, N., Sadradze, N., Menteshashvili, O.,...Sudere, P. (2000). Pulmonary tuberculosis in prisons of the ex-USSR state Georgia: results of a nation-wide prevalence survey among sentenced inmates. *International Journal of Tuberculosis and Lung Disease*, 4:1104-1110.

[2] Alarcón-Robayo, J. F., Martinez-Casallas, L., Sánchez, M. S., Valderrama-Mendoza, J. S., Enriquez, D. M. B., & Jiménez-Canizales, C. E. (2016). Prevalencia de tuberculosis pulmonar en población privada de la libertad de 10 centros penitenciarios en Colombia, 2013. *Acta Médica Peruana*, 33, 202-207.

[3] Baussano I., Williams, B. G., Nunn, P., Beggiato, M., Fedeli, U., & Scano, F. (2010). Tuberculosis incidence in prisons: a systematic review. *PLoS Medicine*, 7, e1000381.

[4] Brasil. Ministério da Saúde. Boletim Epidemiológico Tuberculose. (2015). Retrieved from: http://portalarquivos.saude.gov.br/images/pdf/2015/marco/25/Boletim-tuberculose-2015.pdf.

[5] Brasil. Ministério da Saúde. Mapa do Encarceramento: os jovens do Brasil. (2014a). Brasília: Ministério da Saúde. Retrieved from: http://juventude.gov.br/articles/participatorio/0010/1092/Mapa_do_Encarceramento_-_Os_jovens_do_brasil.pdf.

[6] Brasil. Ministério da Saúde. Programa Nacional de Controle da Tuberculose. Situação da Tuberculose no Brasil. (2014). Brasília: Ministério da Saúde. Retrieved from: http://bvsms.saude.gov.br/bvs/publicacoes/ProgramaTB.pdf.

[7] Câmara, J. T., Menezes, J. B., Pereira, B. M., Oliveira, T. R. C., Oliveira, T. M. P., & Ribeiro, N. S. (2016). Perfil epidemiológico de pacientes com diagnóstico de resistência de mycobacterium tuberculosis. *Revista de enfermagem UFPE*, 10, 4082-4089.

[8] Dara, M., Acosta, C. D., Melchers, N. V. S. V., Al-Darraji, H. A. A., Chorgoliani, D., Reyes, H.,...Migliori, G. B. (2015). Tuberculosis control in prisons: current situation and research gaps. *International Journal of Infectious Diseases*, 32, 111–117.

[9] Deiss, R. G., Rodwell, T. C., & Garfein, R. S. (2009). Tuberculosis and Drug Use: Review and Update. *Clinical Infectious Diseases*, 48, 72-82.

[10] Fávaro, R. A. A., Ferreira, T. N. R., & Martins, W. D. (2006). Xerostomia: etiologia, diagnóstico e tratamento. *Revista de Clínica e Pesquisa Odontológica*, 2, 303-317.

[11] Ferreira, A. A. A., Queiroz, K. C. S., Torres, K. P., Ferreira, M. A. F., Accioly, H., & Alves, M. S. C. F. (2005). Os fatores associados à tuberculose pulmonar e a baciloscopia: uma contribuição ao diagnóstico nos serviços de saúde pública. *Revista Brasileira de Epidemiologia*, 8, 142-149.

[12] Jones, T. F., Craig, A. S., Valway, S. E., Woodley, C. L., & Schaffner, W. (1999). Transmission of tuberculosis in a jail. *Annals of Internal Medicine*, 131, 557-63.

[13] Kalonji, G. M., De Connick, G., Okenge Ngongo, L., Kazumba Nsaka, D., Kabengele, T., Tshimungu Kandolo, F., … Giet, D. (2016). Prevalence of tuberculosis and associated risk factors in the Central Prison of Mbuji-Mayi, Democratic Republic of Congo. *Tropical Medicine and Health*, 44, 30. http://doi.org/10.1186/s41182-016-0030-9.

[14] Negreiros, D. E. H., & Vieira, D. S. (2017). Prevalência de hepatites b, c, sífilis e hiv em privados de liberdade - Porto Velho, Rondônia. *Revista Interdisciplinar*, 10, 43-52.

[15] Nogueira, P. A., & Abrahão, R. M. C. M. (2009). A infecção tuberculosa e o tempo de prisão da população carcerária dos Distritos Policiais da zona oeste da cidade de São Paulo. Revista Brasileira de Epidemiologia, 12, 30-8.

[16] Nyasulu, P., Mogoere, S., Umanah, T., & Setswe, G. (2015). Determinants of Pulmonary Tuberculosis among Inmates at Mangaung Maximum Correctional Facility in Bloemfontein.South Africa. *Tuberculosis Research and Treatment*, 2015, 752-709.

[17] Oliveira, M. G., Delogo, K. N., Oliveira, H. M. M. G., Ruffino-Netto, A., Kritski, A. L., & Oliveira, M. M. (2014). Anemia in hospitalized patients with pulmonary tuberculosis. *Jornal Brasileiro de Pneumologia*, 40, 403-410.

[18] Owokuhaisa, J., Thokerunga, E., & Bazira, J. (2014). Prevalence of Pulmonary Tuberculosis among Prison Inmates at Mbarara Central Prison, South Western Uganda. *Advances in Research*, 2, 618–625. http://doi.org/10.9734/AIR/2014/10676.

[19] Rabahi, M. F. (2012). Tuberculose e tabagismo. *Revista Pulmão RJ*, 21, 46-49.

[20] Ryu, Y. J. Diagnosis of Pulmonary Tuberculosis: Recent Advances and Diagnostic Algorithms. (2015). *Tuberculosis and Respiratory Diseases*, 78, 64-71. doi:10.4046/trd.2015.78.2.64.

[21] Sarang, A., Platt, L., Vyshemirskaya, I., & Rhodes, T. (2016). Prisons as a source of tuberculosis in Russia. *International Journal of Prisoner Health*, 12, 45-56.

[22] Secretaria Estadual de Justiça do Ceará (BR). Monitoramento semanal do efetivo de presos nas unidades prisionais do Ceará. Ceará. (2014). Retrieved from: http://www.mpce.mp.br/wp-content/uploads/2016/03/Portaria-1220.2014-Regimento-dos-Estabelecimentos-Prisionais-Cear%C3%A1.pdf.

[23] Secretaria Estadual de Justiça do Ceará (Brasil). Coordenadoria do Sistema Penal. Núcleo de dados e estatística. Monitoramento semanal do efetivo de presos nas unidades prisionais do Ceará. (2016). Retrieved from: file:///C:/Users/User/Downloads/relatrio%20semanal%20externo%20-%2023.12.14.pdf.

[24] Severo, N. P. F., Leite, C. Q. F., Capela, M. V., & Simões, M. J. S. (2007). Características clínico-demográficas de pacientes hospitalizados com tuberculose no Brasil, no período de 1994 a 2004. *Jornal Brasileiro de Pneumologia*, 33, 565-571.

[25] Silva Junior, J. B. (2004). Tuberculose: Guia de Vigilância Epidemiológica. *Jornal Brasileiro de Pneumologia*, 30, S57-S86.

[26] Souza, K. M. J., Villa, T. C. S., Assolini, F. E. P., Beraldo, A. A., França, U. M., Protti, S. T., & Palha, P. F. (2012). Atraso no diagnóstico da tuberculose em sistema prisional: a experiência do doente apenado. *Texto & Contexto - Enfermagem*, 21, 17-25.

[27] Table 1. Analysis of the association between characteristics of medical records of prisoners following treatment for TB (n=109) and sociodemographic characteristics. Fortaleza, Ceará, Brazil, 2017.

[28] Valença, M. S., Cezar-Vaz, M. R., Brum, C. B., & Almeida da Silva, P. E. (2016). O processo de detecção e tratamento de casos de tuberculose em um presídio. *Ciência & Saúde Coletiva*, 21, 2111-2122.

[29] Valença, M. S., Possuelo, L. G., Cezar-Vaz, M. R., & Almeida da Silva, P. E. (2016). Tuberculose em presídios brasileiros: uma revisão integrativa da literatura. *Ciência & Saúde Coletiva*, 21, 2147-2160.

[30] World Health Organization. (2000). The control of tuberculosis in prisons: a manual for program managers. Retrieved from:

http://apps.who.int/iris/bitstream/10665/66823/1/WHO_CDS_TB_2000.281.pdf.

[31] World Health Organization. Global tuberculosis report. (2016). Retrieved from: http://www.who.int/tb/publications/global_report/gtbr2016_executive_summary.pdf.

[32] World Health Organization. Tuberculosis in prisons. (2014). Retrieved from:http://www.who.int/tb/areas-of-work/population-groups/prisons-facts/en/.

Variables	n (%)	Pale mucosa n= 76 (69.7%)	Cough n=105 (96.3%)	Sputum n=91 (83.5%)	Abnormal breathing pattern n=12 (11.0%)	Positive bacilloscopy n=93 (85.3)
Age group						
18 to 29 years	72 (66.1)	49 (68.1)	70 (97.2)	60 (83.3)	7 (9.7)	65 (90.3)
30 to 39 years	23 (21.1)	17 (73.9)	21 (91.3)	20 (87.0)	3 (13.0)	19 (82.7)
40 years and over	14 (12.8)	10 (71.4)	14 (100)	11 (78.6)	2 (14.3)	9 (64.3)
p value		0.950[2]	0.270[2]	0.857[2]	0.721[2]	0.042[2]
Marital status						
With partner	20 (18.3)	15 (75)	18 (90)	14 (70.0)	2 (10.0)	15 (75.0)
Without partner	89 (81.7)	61 (68.5)	87 (97.8)	77 (86.5)	10 (11.2)	78 (87.6)
p value		0.570[1]	0.153[2]	0.095[2]	1.000[2]	0.167[2]
Years of study						
None	3 (2.8)	2 (66.7)	2 (66.7)	2 (66.7)	-	2 (66.7)
1 to 5 years	56 (51.4)	38 (67.9)	55 (98.2)	45 (80.4)	8 (14.3)	48 (85.7)
6 to 9 years	29 (26.6)	20 (69)	28 (96.6)	26 (89.7)	3 (10.3)	25 (86.2)
More than 9	21	16 (76.2)	20 (95.2)	18 (85.7)	1 (4.8)	18 (85.7)

years	(19.3)					
p value		0.917[2]	0.138[2]	0.470[2]	0.687[2]	0.694[2]
Race						
White	11 (10.1)	6 (54.5)	11 (100)	10 (90.9)	-	9 (81.8)
Black	18 (16.5)	13 (72.2)	17 (94.4)	14 (77.8)	3 (16.3)	15 (83.3)
Pardo	80 (73.4)	57 (71.3)	77 (96.3)	67 (83.8)	9 (11.3)	69 (86.3)
p value		0.512[2]	0.716[2]	0.691[2]	0.457[2]	0.735[2]
BMI						
Underweight	55 (50.5)	45 (81.1)	54 (98.2)	48 (87.3)	7 (12.7)	49 (89.1)
Normal weight	46 (42.2)	25 (54.3)	45 (97.8)	39 (84,8)	5 (10.9)	38 (82.6)
Excess weight	8 (7.3)	6 (75.0)	6 (75.0)	4 (50.0)	-	6 (75.0)
p value		0.009[2]	0.026[2]	0.046[2]	0.899[2]	0.326[2]
Time in prison						
< 1 year	16 (14.7)	13 (81.3)	15 (93.8)	15 (93.8)	2 (12.5)	10 (62.5)
1 |-- 3 years	46 (42.2)	30 (65.2)	43 (93.5)	36 (78.3)	5 (10.9)	39 (84.8)
3 |-- 5 years	19 (17.4)	13 (68.4)	19 (100.0)	17 (89.5)	2 (10.5)	17 (89.5)
> 5 years	28 (25.7)	20 (71.4)	28 (100.0)	23 (82.1)	3 (10.7)	27 (96.4)
p value		0.716[2]	0.383[2]	0.510[2]	1.000[2]	0.028[2]

[1] Chi-squared test; [2] Fisher's Exact test

Table 2. Bivariate analysis of respiratory problems according to harmful habits in prisoners with Tuberculosis. Fortaleza, Ceará, Brazil, 2017.

Variables	n (%)	Pale mucosa n= 76	Cough n=105 (96.3%)	Sputum n=91 (83.5%)	Abnormal breathing pattern	Positive bacilloscopy n=93 (85.3)

		(69.7%)			n=12 (11.0%)	
Smoking						
Yes	70 (64.2)	47 (67.1)	68 (97.1)	62 (88.6)	7 (10.0)	60 (85.7)
No	39 (35.8)	29 (74.4)	37 (94.9)	29 (74.4)	5 (12.8)	33 (84.6)
p value		0.432[1]	0.616[2]	0.055[1]	0.752[2]	1.000[2]
Drinking						
Yes	35 (32.1)	8 (22.9)	34 (97.1)	33 (94.3)	2 (5.7)	31 (88.6)
No	74 (67.9)	25 (33.8)	71 (95.9)	58 (78.4)	10 (13.5)	62 (83.8)
p value		0.246[1]	1.000[2]	0.037[1]	0.331[2]	0.510[1]
Use of illicit drugs						
Yes	29 (26.6)	21 (72.4)	29 (100.0)	26 (89.7)	2 (6.9)	25 (86.2)
No	80 (73.4)	55 (68.8)	76 (95.0)	65 (81.3)	10 (12.5)	68 (85.0)
p value		0.713[1]	0.572[2]	0.389[2]	0.510[2]	1.000[2]

[1] Chi-squared test; [2] Fisher's Exact test