

PREVALENCE OF LATENT MYCOBACTERIUM TUBERCULOSIS INFECTION AMONG PROFESSIONALS OF THE PRIMARY HEALTHCARE NETWORK

Prevalência de infecção latente por mycobacterium tuberculosis em profissionais da rede básica de saúde

Prevalencia de infección latente por Mycobacterium tuberculosis en profesionales de la red básica de salud

Original Article

ABSTRACT

Objective: To estimate the prevalence of latent *M. tuberculosis* infection and identify characteristics related to latent infection among workers of the primary healthcare network. **Methods:** Cross-sectional, observational and descriptive study, conducted in 2011, included 137 basic health workers who performed their activities in a municipality. Interviews were carried out addressing characteristics of exposure at work (BCG vaccination, length of time working in the health system, potential exposure to tuberculosis, HIV infection, use of corticosteroids, diabetes, use of tobacco or alcohol) and subsequently performed tuberculin skin test (TST). Data was analyzed with Fischer and Student's t-test ($p < 0.05$). **Results:** Health professionals were mostly women ($n=126$, 92%) with mean age of 35.3 (± 9.1) years. Among the reactors, 25 (55.5%) sought medical care, and of these, 7 (28%) underwent prophylactic treatment. The prevalence of latent tuberculosis was 32.8%. Of the characteristics evaluated, only smoking (OR 3.03; 95%CI 1.05-8.77) was associated with latent infection. **Conclusion:** The estimated prevalence of latent *M. tuberculosis* infection among the evaluated health workers was 32.8%. As for the characteristics studied, it was not possible to relate them to latent infection among workers in primary healthcare network, with the exception of the smoking habit.

Descriptors: Tuberculosis; Tuberculin Test; Prevalence; Health Personnel.

RESUMO

Objetivo: Estimar a prevalência de infecção latente por *M. tuberculosis* e identificar características relacionadas à infecção latente entre os trabalhadores da rede básica de saúde. **Métodos:** Estudo transversal, observacional e descritivo, realizado em 2011, incluiu 137 trabalhadores da rede básica de saúde que desempenhavam suas atividades em um município. Realizaram-se entrevistas abordando características de exposição no trabalho (vacinação com BCG, tempo de trabalho na rede de saúde, exposição potencial à tuberculose, infecção pelo HIV, uso de corticoides, diabetes, uso de tabaco ou álcool) e, posteriormente, aplicouse o teste tuberculínico (TT). Analisaram-se os dados com teste Fischer e T-Student ($p < 0,05$). **Resultados:** Os profissionais da saúde eram majoritariamente mulheres ($n=126$, 92%), com idade média de 35,3 ($\pm 9,1$) anos. Entre os profissionais reatores, 25 (55,5%) buscaram assistência médica – destes, 7 (28%) realizaram tratamento profilático. A prevalência de tuberculose latente foi de 32,8%. Das características avaliadas, somente o tabagismo (OR:3,03; IC 95% 1,05-8,77) foi associado à infecção latente. **Conclusão:** A prevalência estimada de infecção latente por *M tuberculosis* entre os trabalhadores de saúde avaliados foi de 32,8%. Quanto às características estudadas, não foi possível relacioná-las com a infecção latente entre os trabalhadores da rede básica de saúde, com exceção do tabagismo.

Descritores: Tuberculose; Teste Tuberculínico; Prevalência; Pessoal de Saúde.

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RESUMEN

Objetivo: Estimar la prevalencia de infección latente por *M. tuberculosis* e identificar las características relacionadas a la infección latente de los trabajadores de la red básica de salud.

Métodos: Estudio transversal, observacional y descriptivo realizado en 2011 con 137 trabajadores de la red básica de salud que desarrollaban sus actividades en un municipio. Se realizaron entrevistas sobre las características de exposición del trabajo (vacunación con BCG, tiempo de trabajo en la red de salud, exposición potencial a la tuberculosis, infección por el VIH, uso de corticoides, diabetes, uso de tabaco o alcohol) y, a posteriori, se aplicó la prueba de la Tuberculina (PT). Los datos fueron analizados con la prueba de Fisher y el t-student ($p < 0,05$). **Resultados:** Los profesionales sanitarios eran en su mayoría mujeres ($n=126$, 92%) y edad media de 35,3 ($\pm 9,1$) años. De los profesionales reatros, 25 (55,5%) buscaron la asistencia médica – de estos, 7 (28%) realizaron tratamiento profiláctico. La prevalencia de tuberculosis latente fue del 32,8%. De las características evaluadas solamente el tabaquismo (OR: 3,03; IC 95% 1,05-8,77) estuvo asociado a la infección latente.

Conclusión: La prevalencia estimada de infección latente de *M. tuberculosis* de los trabajadores sanitarios evaluados fue del 32,8%. No ha sido posible relacionar las características estudiadas con la infección latente entre los trabajadores de la red básica de salud, a excepción del tabaquismo.

Descriptores: Tuberculosis; Prueba de la Tuberculina; Prevalencia; Personal de Salud.

INTRODUCTION

The World Health Organization (WHO) estimates that more than a third of the population (around 2 billion people) is infected with *Mycobacterium tuberculosis* and can be considered carrier of latent tuberculosis infection^(1,2). Of this broad group, it is expected that about 200 million people (10%) develop the disease in the active form, 80% being bacilliferous, which is the basic condition for the perpetuation of tuberculosis cycle, resulting in continuity of the disease morbidity and mortality⁽¹⁾.

Within the alternatives to reduce the impact of tuberculosis in the long-term, these stand out: the early and rapid diagnosis for all people with active tuberculosis, enabling to establish the drug therapy and reduce transmission rates; and the detection of cases when they are still in the latent form of tuberculosis, preventing the late development of the disease through chemoprophylaxis with isoniazid (INH)^(1,3).

Among health professionals, tuberculosis is considered an occupational disease⁽⁴⁾. In addition to exposure to infected patients, the conditions under which the health professionals exerts their activity, especially in poorly ventilated spaces,

and carrying out procedures with exposure to contaminated aerosols, make them particularly liable to the risk of infection with *M. tuberculosis*⁽⁵⁻⁸⁾. In health professionals, the incidence of tuberculosis accompanies the numbers of the general population of the geographical area to which they belong⁽⁹⁾, added the specific risk as a professional group^(9,10).

Epidemiological studies have demonstrated that professionals working in prisons and hospitals serving patients with tuberculosis and infected by HIV, or drug users, as well as laboratory workers, therapists and respiratory therapists, anesthesiologists, surgeons and psychiatrists, hospital cleaning workers, and funeral staff belong to occupational groups at high risk of infection with *M. tuberculosis*⁽⁸⁻¹¹⁾.

The prevalence of infection among professionals of the Basic Health Units - BHU (*Unidades Básicas de Saúde - USB*) and the Family Health Strategy - FHS (*Estratégia de Saúde da Família - ESF*) is, however, poorly understood in Brazil. Although such units are not specialized in the treatment of TB, they represent the gateway to the detection of cases.

Therefore, the objectives of this study were to estimate the prevalence of latent infection with *M. tuberculosis* and identify characteristics related to latent infection among workers of the primary healthcare network.

METHODS

This is an observational, cross-sectional and descriptive study, conducted with employees of the primary healthcare network who performed their activities in Santa Cruz do Sul, RS, located in the region known as Rio Pardo Valley, in the lower slopes of the northeast of the state of Rio Grande do Sul. The municipality has 11 Family Health Teams (FHT) and 12 BHU. The coverage of the population by the FHT is 30%, while BHU cover the remaining 70%. The number of professionals working in the primary healthcare network is 186, with 123 FHS workers and 63 in UBS's employ.

Of 186 professionals in total who were working in the basic network, were included in this study all professionals with working time above three months and less than 25 years, and who agreed to participate in the study, totalling 137 professionals evaluated. The sample loss refers to 49 employees who have not attained the above criteria.

Data collection took place between September and December 2011, in two stages: the first consisted of an interview with the application of an epidemiological questionnaire; the second one consisted in the application of the tuberculin skin test (TST) by properly trained nursing technician working in the tuberculosis outpatient clinic of the municipality of Santa Cruz do Sul, RS.

Starting from the structured questionnaire validated in a previous study⁽¹²⁾, data was collected regarding the BCG vaccination history, length of time working in the health system, potential exposure to tuberculosis, HIV infection, use of corticosteroids, diabetes, and use of tobacco or alcohol. The survey instrument was individually applied, without predetermined time to complete the interview. Every day, a health facility was visited. All employees were invited to participate. Those who fit the inclusion criteria were interviewed and tested.

TST was carried out as recommended by the Technical Handbook for Tuberculosis Control⁽¹³⁾. Professionals with induration greater than or equal to 10 mm were thus defined as positive TST (reactors). All professionals surveyed with positive TST were instructed and referred for consultation with a specialist doctor in the municipal tuberculosis outpatient clinic. Some of those invited to participate in the study had undergone the TST in previous studies, and those who previously tested negative (non-reactive) had a second test to evaluate the conversion rate, considering as TST conversion an increase of 10 mm in induration size in comparison with the reading of the test performed in the previous year.

For epidemiological characterization, descriptive and univariate analysis were performed in the SPSS software, version 18.0, using absolute and percentage values. For groups comparison, the Fischer test was used with 95% confidence interval and a significant *p* value <0.05. The Student's *t*-test allowed the comparison of means.

All participants signed a free and informed consent form, and the Research Ethics Committee of the University of Santa Cruz do Sul approved this research (No. 2764/10).

RESULTS

The amount of 137 professionals responded to the questionnaire and performed the TST, corresponding to 73.6% of the network professionals. Among the evaluated, 126 (92%) were women, and the participants' mean age was 35.3 (\pm 9.1) years. As for the function in which they worked in the health units, 46 (33.6%) were community health workers (CHW), 19 (13.9%) were members of the Oral Health Team, 50 (36.5%) were part of the Nursing Team, 5 (3.6%) were physicians and 17 (12.4%) had other activities (trainees, drivers, maintenance personnel and hygiene services). All the professionals included had participated

Table I - Epidemiological characteristics of study participants regarding the tuberculin skin test (TST) result. Santa Cruz do Sul, RS, 2011.

Characteristic	Reactor n=45 (%)	Non-reactor n=92 (%)	Total n=137 (%)	<i>p</i>	OR (CI95%)
Smoking					
Smoker	9 (56.3)	7 (43.8)	16 (11.7)	0.02	3.03 (1.05- 8.77)
Non-smoker	36 (29.75)	85 (70.25)	121 (88.3)		
Immunosuppressive Drug					
Yes	1 (50.0)	1 (50.0)	2 (1.5)	0.551	2.06 (0.12-33.8)
No	44 (32.6)	91 (67.4)	135 (98.5)		
TB History in the past					
Yes	1 (33.3)	2 (66.7)	3 (2.2)	0.70	1.02 (0.09- 11.5)
No	44 (32.8)	90 (67.2)	134 (97.8)		
BCG Vaccine					
Yes	44 (32.8)	90 (67.2)	134 (97.8)	0.99	0.97 (0.08-11.08)
No	1 (25.0)	2 (75.0)	3 (1.5)		
Level of Education					
Incomplete secondary level	6 (37.5)	10 (62.5)	16 (11.7)	0.61	-----
Complete secondary level	27 (36.5)	47 (63.5)	74 (54.0)		
Higher Education	8 (26.7)	22 (73.3)	30 (21.9)		
Higher Education with graduate program	4 (23.5)	13 (76.5)	17 (12.4)		

Considered as 'non-reactor' that professional whose induration size was less than 10 mm and 'reactor' the worker with induration equal to or greater than 10 mm. OR: odds ratio of prevalence; TB: tuberculosis; BCG: professional who underwent or not BCG vaccination.

in training on tuberculosis six months prior to the present study, on average.

Epidemiological and sociodemographic characteristics of the sample are described on Tables I and II.

The prevalence of latent tuberculosis infection in the study population was 32.8% (n=45). Among the professionals reactors, 25 (55.5%) sought medical care because of latent tuberculosis - of these, 7 (28%) had

prophylactic indication. Being a smoker (OR: 3.03; 95% CI 1.05-8.77) was the only characteristic associated with higher risk of having a positive TST compared to non-smokers.

Of all the respondents, 49 (36%) reported having previously performed TST - of these, 23 (38.3%) had undergone the TST in a previous study. Only 1 (4.3%) professional showed the test conversion.

Table II - Description of the evaluated population according to the characteristics related to the work of the study participants. Santa Cruz do Sul, RS, 2011.

Characteristic	Reactor n=45 (%)	Non-reactor n=92 (%)	Total n=137 (%)	<i>p</i>
Workload in the Unit				
6 hours	0 (0.0)	3 (100)	3 (2.2)	---
8 hours	44 (33.8)	86 (66.2)	130 (94.9)	
Other*	1 (25.0)	3 (75.0)	4 (2.9)	
Workplace				
BHU	8 (25.0)	24 (75.0)	32 (23.3)	0.195
FHS	37 (35.2)	68 (64.8)	105 (76.6)	
Exposure to TB individuals				
At work	31 (32.3)	65 (67.7)	96 (70.1)	0.65
At home	2 (66.7)	1 (33.3)	3 (2.2)	
At work and at home	1 (33.3)	2 (66.7)	3 (2.2)	
Did not report contact	11 (31.4)	24 (68.6)	35 (25.5)	
Professional Category				
Community Agent	17 (37.0)	29 (63.0)	46(33.6)	0.78
Oral Health Team	4 (21.1)	15 (78.9)	19 (13.9)	
Nursing team	16 (32.0)	34(68.0)	50 (36.5)	
Physician	2 (40.0)	3 (60.0)	5 (3.6)	
Others **	6 (35.3)	11 (64.7)	17 (12.4)	
Time of Employment***				
≤ 7 years	24 (37.5)	40 (62.5)	64 (50)	0.227
> 7 years	19 (29.7)	45 (70.3)	64 (50)	

*Refers to another workload performed in unit, which is <4 hours or> 8 hours. **Trainees, drivers, cleaning staff. ***Excluding trainees. BHU: Basic Health Unit; FHS: Family Health Strategy; TB: tuberculosis.

DISCUSSION

Accurate diagnosis of latent *M. tuberculosis* infection by means of the TST is an important component for any tuberculosis control program, especially in risk groups such as healthcare professionals, who have a longer exposure time to patients with active tuberculosis⁽¹²⁾.

In the present study, we observed a rate of 32.8% positive TST among workers in primary health care network. In a similar study, also developed in the basic network of the city of Santa Cruz do Sul, RS, the percentage found was 26.7%⁽¹²⁾. In other studies conducted in Brazil, this percentage ranged from 26.7% to 69.5% positivity among health professionals^(14,15).

The CHA and the nursing staff account for about 70% of the professionals interviewed, with positivity rates of 37% and 32%, respectively. The positivity rate found in the CHA was 22.4%⁽¹⁴⁾ in another study. Research⁽¹²⁾ carried out in 2011 showed that members of the nursing team had a positivity rate of 30%. These data indicate that the professionals involved in direct patient care have higher positivity rates⁽¹⁶⁾, since both the nursing team and the CHA are directly involved with the assistance provided to patients with tuberculosis, since the detection of the case, monitoring, and treatment follow-up. Another factor that could probably corroborate these rates is the fragility in professional training for the management of suspected and confirmed cases of tuberculosis, exposing them to even further risk of infection⁽¹⁷⁾. Therefore, awareness of the need to seek early diagnosis and treatment of active tuberculosis is of utmost importance, in addition to encouraging the health team members to minimize the risk of contracting the infection⁽⁸⁾. It is thus necessary to stimulate the development of a safe workflow, adapting a better management of disease cases to the local infrastructure⁽¹²⁾.

Numerous factors have been associated to TST positivity, including alcoholism, smoking, duration of employment, socioeconomic factors, age, gender, skin colour, use of corticosteroids, diabetes, HIV and other forms of immunosuppression⁽¹²⁾. Among the health professionals in this study, the smokers had higher risk of positive TST compared to non-smokers. A study⁽¹⁸⁾ conducted recently in the same city, comparing the TST and interferon-gamma release assay (IGRA) in health workers, did not observe association of these variables in both tests.

It was observed that, among workers with less years of service, TST positivity was higher. In recent studies^(12,19), workers with less than 4 years of exposure had a significantly higher positivity rate compared with those who had longer exposure time. The increased risk for TST positivity would be 1 year. Therefore, prevention should be emphasized in professional admission to health services, establishing, for example, the TST as a routine admission examination.

Other investigated characteristics, however – such as the use of immunosuppressive drug, history of tuberculosis in the past, length of service in the unit, type of work unit, contact with tuberculous people, professional category and level of education – did not show association.

The TST conversion rate in this study was considered high when compared to studies in low-prevalence settings, with a rate of 0.11%, and high-prevalence settings, with rates of 1.9% to 2.3%⁽²⁰⁾. In the last decade, the American literature has shown a decrease in tuberculin conversion rates as a result of the adoption of control measures of the tuberculosis nosocomial transmission⁽²¹⁾. It is thus important that professionals in the basic network are encouraged to

achieve early identification of the symptomatic respiratory (SR) individuals in order to diagnose and reduce the patient's length of stay in the unit before starting of treatment.

Periodic training of the health professionals on tuberculosis control, the mapping of risk areas, screening and referral of patients with suspected disease in its active form are strategies for reduction of the TST conversion rates⁽⁸⁾. Furthermore, it is necessary to establish a SR evaluation routine in health units, which comprises all professionals, involving identification, early intervention and adoption of preventive measures such as use of personal protective equipment (PPE) and guidance to the patients⁽²²⁾.

BCG vaccination can lead to the development of cross-reactivity with PPD. Among the professionals reactors that participated in this study, 97% had BCG. According to a study⁽²³⁾ that compared the TST with the QuantiFERON-TB Gold In-Tube method (FTQ-GIT) in healthcare workers, the use of both tests is a way to exclude possible false-positive results that occur mainly due to BCG vaccination. Future studies are thus needed comparing the TST and QTF-GIT results in this population.

In short, the prevalence of infection with *Mycobacterium tuberculosis* found in this study is similar to that in the general population⁽²⁴⁾. Regarding the study previously conducted in the same municipality, the observed frequencies are similar⁽¹²⁾.

Finally, the current research findings provide useful information for the teams specialized in occupational medicine, which can encourage the use of TST as a biosafety tool, focused on the establishment of measures. New studies comprising greater number of analyzed workers are needed, and the inclusion of new latent infection screening methods, such as the FTQ-GIT, can aid in proper identification of cases of latent tuberculosis infection. It is also important to monitor the studied population to evaluate the reversion rates.

CONCLUSION

The estimated prevalence of latent *M. tuberculosis* infection among the evaluated healthcare workers was 32.8%. Regarding the studied characteristics, no association was verified with the latent infection among workers in primary healthcare network, except the smoking habit.

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