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Tuberculosis control in a Brazilian prison system: a mixed methods study

Control de la tuberculosis en un sistema penitenciario brasileño: un estudio con métodos mixtos

Controle da tuberculose em um sistema prisional brasileiro: um estudo com métodos mistos

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Abstract

Objective: to analyze tuberculosis control in a prison system of a Brazilian state. **Method:** this was a sequential explanatory mixed study. In phase I, a quantitative retrospective description was conducted of recorded tuberculosis cases among prisoners in the state of São Paulo from 2010-2016, which were analyzed using simple frequencies with IBM SPSS 20.0 software and time-trend with Stata software/SE 14.0 via Prais-Winsten regression. Phase II was qualitative and was based on interviews with six key informants (health professionals working at a prison). Data analysis took place according to the procedures set forth in constructivist grounded theory. **Results:** of 16,640 cases of tuberculosis, 95.8% were pulmonary, outpatient care accounted for the diagnosis in 51.4% of cases, and tuberculosis cure was the most frequent treatment outcome. "Doing your job well" emerged as the central category, while the subcategories: "discovering the disease" and "getting involved in treatment" described the strategies and actions developed by the professionals to diagnose and treat sick prisoners. **Conclusions and implications for practice:** the results indicate the significant presence of tuberculosis in penitentiaries and the need to better coordinate the actions of security teams with health staff to develop adequate strategies that allow for early diagnosis and proper treatment.

Keywords: Tuberculosis; Prisons; Prisoners; Diagnosis; Directly Observed Therapy.

Resumen

Objetivo: analizar el control de la tuberculosis en un sistema penitenciario de un Estado brasileño. **Método:** estudio mixto explicativo secuencial. Fase I: descriptiva retrospectiva de los casos de tuberculosis en presos del estado de São Paulo en el periodo 2010-2016. Los casos se analizaron con frecuencias simples en el software SPSS 20.0 de la IBM y tendencia temporal en el software Stata/SE 14.0, por auto regresión de Prais-Winsten. Fase II: cualitativa. Se realizó con seis informantes-clave (profesionales sanitarios de una prisión) con base en la Teoría Fundamentada Constructivista. **Resultados:** de 16.640 casos, 95,8% eran pulmonares, la Demanda Ambulatoria posibilitó el diagnóstico del 51,4%, y la curación fue la conclusión de tratamiento más frecuente. La categoría central fue: "Hacer bien su trabajo" y las subcategorías fueron: "Descubrir la enfermedad" e "Implicarse en el tratamiento". Éstas señalaron las estrategias y acciones desarrolladas por los profesionales para diagnosticar y tratar a los presos enfermos. **Conclusión e implicaciones para la práctica:** los resultados sugieren una importante situación de la tuberculosis en penitenciarías, lo que trae consigo la necesidad de mejor articulación con el equipo de seguridad para un adecuado desarrollo de las estrategias que posibilitan un diagnóstico temprano y un tratamiento adecuado.

Palabras claves: Tuberculosis; Prisiones; Prisioneros; Diagnostico; Terapia por Observación Directa.

Resumo

Objetivo: analisar o controle da tuberculose em um sistema prisional de um Estado brasileiro. **Método**: estudo sequencial, misto, explanatório: fase I - retrospectiva descritiva em que foram incluídos todos os casos de tuberculose em presidiários de um Estado brasileiro, período 2010-2016, e analisados por frequências simples, no software IBM SPSS 20.0, e tendência temporal, no Software Stata / SE 14.0, por autorregressão de *Prais-Winsten*; Fase II - qualitativa, realizada com seis informantes-chave (profissionais de saúde de uma prisão), e a análise ocorreu segundo os procedimentos da Teoria Fundamentada Construtivista. **Resultados**: dos 16.640 casos, 95,8% eram pulmonares, a Demanda Ambulatorial permitiu o diagnóstico de 51,4%, e a cura foi a finalização de tratamento mais frequente. "Fazer bem o seu Trabalho" foi apresentado como categoria central, e as subcategorias, "Descobrindo a doença" e "Envolvendo-se no tratamento", indicaram as estratégias e ações desenvolvidas pelos profissionais para diagnosticar e tratar os presos enfermos. **Conclusão e implicações para a prática**: os resultados sugerem uma situação importante da tuberculose nas prisões, sendo necessária uma melhor articulação com a equipe de Segurança para o desenvolvimento adequado de estratégias que permitam um diagnóstico precoce e tratamento adequado.

Palavras-chave: Tuberculose; Prisões; Prisioneiros; Diagnóstico; Terapia Diretamente Observada.

INTRODUCTION

Tuberculosis (TB) is an infectious and contagious disease that affected approximately 10 million people worldwide in 2018, with stable statistics in recent years[1]. In prisons, TB is related to the situation of many individuals living together who are at increased risk for developing the disease, considering that they are closed and overcrowded institutions with impaired health and hygiene, facilitating the spread of the infection[2,3].

Globally, 9.9 million people are deprived of their liberty, most of them in prisons[1]; the Brazilian prison population comes in fourth in the world. Furthermore, of all the TB cases in the country, 11% occur among inmates[4,5], creating a significant problem, in addition to contagion among the inmate population, this risk also exists through their contact with free individuals, whether when they are released or when being visited by loved ones.

In light of the above, in 2003, the Brazilian Ministry of Health has implemented the TB Control Program in prisons across the country. The ministry has also conducted a study about the difficulties of implementing this program, whose results point to difficulties in inmate access to the health services of the institution and to those of society in general. These are due to lack of financial investment and the need for coordination between the Ministry of Justice and the Ministry of Health[6].

A literature review conducted in Portugal identified that the greatest difficulty in controlling TB in the country's prisons was overcrowding, lack of human, material and financial resources, and difficulties in coordinating the actions of health and security teams[7].

However, a more relevant factor in the Brazilian reality is the lack of research aimed at understanding the development of TB control management in prisons and the barriers faced by health professionals to implementing the ministry's TB Control Program.

Over the years, different studies have been conducted about the TB problem in Brazilian prisons that address the epidemiological, clinical and sociodemographic characteristics of TB among inmates and the risk factors for developing the disease, in addition to factors related to the treatment completion or the susceptibility to and genotypes of TB in the prison population[6,8,9].

However, there are no studies specifically aimed at increasing understanding of the magnitude of the TB problem in Brazilian prisons and the development of actions for its control in these institutions. Such research could help to better identify points that need to be improved and potentialities for carrying out such actions.

For this reason, the goal of the present study was to develop a broader and deeper understanding of TB control events in prisons[10] and to propose new strategies that enable the improvement of TB control in prisons. This could result in possible changes to the TB Control Program guidelines proposed by the Ministry of Health so that they can be more aligned with the reality of the development of existing control actions in Brazilian prisons.

Considering the innovative and important nature of this study, the following research question was formulated: What are the conditions of the TB control program in the Brazilian prison system? The objective was to analyze tuberculosis control in a prison system of a Brazilian state.

METHOD

This was a sequential explanatory mixed study or qualitative follow-up approach study, divided into two phases (phase I: quantitative and phase II: qualitative), with priority to the qualitative phase, classifying it as a "quan →QUAL" mixed methods study[10,11].

The study was carried out in the Penitentiary System of the State of São Paulo, which is the state with the largest prison population in the country, accounting for 36% of the total number of prisoners in Brazil. In 2017, when the data were collected, São Paulo had 170 prisons and more than 13 prisons were expected to be opened[4].

Phase I consisted of a quantitative retrospective descriptive study of TB control based on secondary data of TB cases in São Paulo state prisons. In phase II, a qualitative study was carried out based on interviews with health professionals about how the TB Control Program was implemented in a specific prison in the State of São Paulo.

Phase I included all cases of prisoners who were reported to have TB in the State of São Paulo prisons between 2010 and 2016.

Phase I data were obtained from the State Center for Epidemiological Surveillance in January 2017 and recorded on an electronic Microsoft Excel®2013template. The variables of interest were: year of notification, type of case (new, retreatment, relapse), clinical presentation (pulmonary; extrapulmonary + spread), health conditions (HIV/AIDS; alcoholism, drug addiction); how the diagnosis was made (outpatient demand, active search, urgency/emergency care, clarification of inpatient diagnosis, active contact tracing, discovered after death), type of treatment (self-administered therapy, direct observation therapy), completion of treatment (cure, abandonment, resistance, TB death, non-TB death). The variables were analyzed and the results are presented in Table 1 and 2 in the results section.

A descriptive analysis of both the quantitative and qualitative variables was conducted using the Statistical Package for the Social Sciences (SPSS) 20.0, including absolute and relative frequencies, mean, and standard deviation (SPSS) 20.0.

Temporal trends were calculated using the variables "health conditions" and "treatment completion". First, "health condition" incidence was calculated annually and the denominator was the state's inmate population, for each year of the studied period, information obtained from by the Ethics Committee of the State Secretariat of Prison Administration (CEP-SAP). At the same way, the incidence of "treatment completion" was also calculated regarding that the denominator was the total number of new cases of the disease annually (during the studied period) among state prisoners.

Thus, to classify temporal trends, the incidences of these variables were logarithmitized with base 10 and analyzed using Stata/SE 14.0 software. Prais-Winsten regression was used to correct the first order autocorrelation regression in the analysis of series of values organized over time[12], with a confidence interval

of 95%. The trends for each of these groups were classified as stationary, upward or downward.

Phase II of the study was carried out in one specific prison in the state of São Paulo, which was selected for having the largest number of prisoners and for having a closed and semi-open incarceration regimen. The health team consisted of 12 professionals: the director of the institution; a psychologist; two registered nurses; a nursing technician; four nursing aides; the prison health officer; a clinical doctor, and a dentist. The name of the prison investigated in phase II is kept anonymous to avoid the identification of the professionals.

Phase II participants were selected using purposive sampling[13], selecting the professionals who were involved in TB management actions. Furthermore, they had to meet the criterion of having at least six months' experience at the prison. Thus, the total sample comprised six healthcare professionals.

Using the methodological precepts of a mixed sequential explanatory method research[11], and based on the analysis of phase I data, important results were identified, which allowed for the development of phase II. This phase included semi-structured interviews with the professionals about their approach to TB diagnosis and treatment in the institution. The following interview prompts were used: Please comment on the TB diagnostic and treatment actions developed in this institution; Please comment on how TB diagnosis and treatment actions are carried out; Please comment on the TB case management; Please comment on your experience with TB treatment in the institution. These prompts led to other questions that emerged during the interviews according to the participants' answers.

The participants were contacted directly at the prison in April 2017. The interviews were scheduled ahead of time and were approved by the director of the institution. They were conducted by the main researcher, who had no previous bond with the respondents, in a private office in the infirmary.

The interviews were audio-recorded and lasted between 60 and 100 minutes. The answers were fully transcribed by the main researcher and were checked against the recordings to verify their accuracy. The transcribed interviews were analyzed qualitatively as per the procedures of constructivist grounded theory (CGT)[14], a method that is conducted manually, without the use of software. It should be noted that, in addition to these data extracted from the interviews, shadow data were also used[15], collected from health professionals working in another state prison.

According to CGT procedures, in the open coding phase, the transcripts were analyzed line by line, which yielded the following codes related to the TB control process: "perform tests" and "seize opportunities". In the focused coding phase, the codes identified in the microanalysis were grouped, such as "inquiring about symptoms" and "ensuring treatment". Last, categories were developed. The process of analyzing and validating the research categories was performed by the main researcher (first author) and the second author. Theoretical sampling was carried out to refine and develop the emerging categories.

The method of constant comparison was used at each phase of the analysis. The data were compared within the same interview and among different ones, allowing the researchers to identify similarities and differences[16]. Analytical memos were developed during the analysis[16] and the literature was consulted to support the construction of the categories. This study was based on the criteria of credibility, originality, resonance, and usefulness in accordance with the CGT[14].

To preserve the anonymity of the participants, each of them was assigned a letter "I" (Interviewee) and a number between 1 and 6, which correspond to the order in which the interviews were conducted.

This study was approved by the Ethics Committees of the Higher Education Institution, with approval number CAAE: 58412716.0.0000.5393 and SAP, CAAE number: 58412716.0.3001.5563. A request was made to waiver the need for an informed consent in phase I, and all the professionals who were interviewed in phase II did so voluntarily and signed informed consent forms. This study abided by the ethical and legal aspects of research with human beings as per Resolution no. 466/2012 of the National Health Council.

RESULTS

Over the seven-year period (2010-2016), a total of 16,640 cases of prisoners with TB were reported in the state of São Paulo, with a change in incidence of 869.9 cases/100,000 inhabitants in 2010 and 1015.2 cases/100,000 inhabitants in 2016, of which 95.8% were pulmonary cases.

Most patients were men (97.9%), self-reported as Black (47.5%), and had a mean age of 30 years (median 29 years and standard deviation of 7.9 years). Of the total cases diagnosed, 79% were new cases and in more than 50%, the diagnosis was reached via outpatient demand, followed by active search of symptomatic respiratory cases, as shown in Table 1.

Regarding the health conditions of the patients, the use of illegal and legal drugs showed an upward trend among the cases diagnosed in the study period. Co-infection with HIV/AIDS was present in nearly 10% of the cases, presenting a downward trend.

In 88% of cases, treatment termination was due to achieving a cure, an outcome that presented an upward trend, followed by treatment abandonment (6.7%).

Table 2 presents the percentage of cases and temporal trends by health conditions and treatment completion.

Direct observation therapy (DOT) was performed in 90% of cases. Additionally, 3.7% of cases were self-administered, and in 6,3% of cases, the type of treatment remained unknown.

Regarding the qualitative study, the participating health professionals were all members of the nursing staff (three nursing aides, one nursing technician, and two registered nurses), mostly women (66.6%), between 27 and 68 years old, and with 5 to 20 years of experience working in the prison system.

"Doing your job well" was the central category that emerged to describe TB control. The professionals said that carrying out proper TB management and providing care to the sick prisoners

Table 1. Distribution of the profile of clinical characteristics, according to the type of case and method of TB diagnosis of prisoners in the São Paulo state penitentiary system between 2010 and 2016, São Paulo-SP, Brazil.

Clinical and discovery characteristics of the disease (n= 16,640)		Period 2010 – 2016 (n)	%
Case type	New	13,151	79.0
	Relapse	2,316	13.9
	Retreatment[a]	1,173	7.0
Method of TB diagnosis	Outpatient Demand	8,562	51.4
	Active Search	5,188	31.1
	Urgency / Emergency	922	5.5
	Diagnostic clarification in hospitalization[b]	789	4.7
	Active Contact Search	784	4.7
	No information	360	2.1
	Discovered after death	35	0.2

[a]Cases of retreatment due to abandonment, drug resistance or change of treatment. [b]Cases hospitalized in prison hospital and/or public hospital.
Source: Epidemiological Surveillance Center of the State Secretariat of Health. Tuberculosis information system.

Table 2. Distribution and temporal trend of the profile of cases according to health conditions and completion of treatment of tuberculosis cases in prisoners of the penitentiary system of a state of São Paulo, period 2010 to 2016, São Paulo-SP, Brazil.

Case profile	Period 2010-2016 (n)	%	Period 2010 -2016 Ratio [95% CI]	Temporal Trend
Health conditions				
HIV/AIDS	1,423	8.6	-0.046 [- 0.062; - 0.030]	Downward
Alcoholism	1,032	6.2	0.077 [0.055; 0.098]	Upward
Use of illicit drugs	2,753	16.5	0.055 [0.037; 0.074]	Upward
End of treatment				
Cure	14,637	88.0	0.001 [0.000; 0.002]	Upward
Abandonment	1,122	6.7	-0.026 [- 0.041; - 0.011]	Downward
Resistance	199	1.2	0.005 [- 0.046; 0.058]	Stationary
TB death	78	0.5	0.021 [- 0.012; 0.056]	Stationary
Non-TB death	252	1.5	-0.099 [- 0.116; - 0.081]	Downward

Source: Epidemiological Surveillance Center of the State Secretariat of Health. Tuberculosis information system.

was an essential part of their job. As part of this process, two subcategories emerged: "discovering the disease" and "getting involved in the treatment of the disease." These actions were particularly important considering that they worked in the limited condition of the prison, which was not conducive to the detection and treatment of the disease. The subcategories consisted of the strategies adopted by the professionals, through which they developed TB control actions in the process of caring for patients (Table 3).

Discovering the disease was the first step in TB control; in fact, there two strategies enabled this action: "investigating what is hidden" and "investigating what is manifest". Diagnosing TB is not always simple and is more difficult in prison environments. Therefore, professionals must engage in discovering what may be hidden or ignored by prisoners who have TB.

The strategy of exploring what is hidden allows health professionals to discover the health condition of prisoners; taking advantage of their presence in the infirmary to evaluate them for TB symptoms. Professionals were aware that some prisoners could have TB but not be seeking care, and if they go to the infirmary, they do not verbalize their symptoms. This underscores the importance of professionals taking the opportunity whenever they come into contact with inmates in the infirmary and inquire about the signs and symptoms most characteristic of TB, primarily coughing.

Table 3. Subcategories and strategies carried out by health professionals in the care process for tuberculosis patients, under the Central Category, 2021, São Paulo-SP, Brazil.

Core Category: Doing Your Job Well	
Subcategories	Strategies
Discovering the disease	Investigating what is hidden
	Investigating what is manifest
Getting involved in the treatment of the disease	Persuading patient to start treatment
	Providing orientation about care and treatment
	Coercing patients to comply with treatment

Source: Prepared by the authors.

They were explained that they could not contact the inmates in their cells because of the limits imposed by the prison security team, a limitation that hindered TB detection. Therefore, they considered it very important that other people in the prison environment be aware of and informed about TB symptoms and the importance of diagnosis. To this end, they counted on the help of security agents and inmates, as expressed by one participant:

> […] *So if they* [inmates] *see that their cellmate is not well, that they have all the symptoms,* […] *they notify the guards, who bring the sick person here.* (I2).

Another action performed by professionals to identify TB cases was in collaboration with security agents: twice a year, the agents administered questionnaires prepared by the health professionals to the inmates regarding the presence of any symptoms of the disease such as coughing, night fever and/or weight loss:

> […] *We carry out an active search in the cells and assess their symptoms, whether they have fevers, are losing weight, or have a cough* [...] (I5).

The participants expressed that identifying sick inmates requires commitment and constant search. Thus, when a positive case of TB is discovered and diagnosed, an active search for their contacts ensues to try to ensure that no inmate is left undiagnosed and that all prisoners who have shared a cell with the sick inmate are submitted to diagnostic exams. However, the professionals expressed that it was only possible to investigate those who shared a cell with a positively diagnosed inmate at the time of diagnosis, because, for security reasons, prisoners constantly changed cells, making the professionals' work difficult.

The strategy of "investigating what is manifest" was used by the professionals when they perceived clinical manifestations of TB in prisoners who accessed the nursing facility, differentiating prisoners whose symptoms effectively corresponded to TB from those who presented symptoms that coincided with other health conditions. The professionals were aware of the health conditions most common among inmates, such as HIV/AIDS and drug addiction, which can lead to weight loss, fever, and cough. This requires that tests be run in all suspected cases to confirm the diagnosis:

> […] *Let's say that they are presenting only a cough, or only fever, that is, they presented only one symptom, then we decide to request a bacilloscopy, just to be safe* [...] (I1).

The professionals also expressed that they could not and should not underestimate any signs and symptoms described by inmates when they are at the nursing facility because of security reasons and overcrowding, which hinders access of the nursing staff to inmates. Therefore, when inmates are at the nursing facility the health professionals understand that is an opportunity to diagnoses and they take the necessary time needed to care for these inmates and perform the necessary tests.

In addition to diagnosing TB, the study participants were also involved in its treatment and they described the strategies adopted according to the different stages that TB treatment requires and treatment compliance of inmates (Figure 1).

At the beginning of treatment, the bacilliferous prisoner must be isolated in the infirmary and the continuity of treatment takes place on an outpatient basis. Due to the security team's difficulties in guaranteeing that prisoners are transferred every day to receive TB medication in the infirmary, health professionals resort to respiratory isolation in the infirmary for at least 15 days, which in this prison was the only time when professionals could perform DOT with patients.

However, inmates do not usually like being isolated in the infirmary, as they cannot be with other prisoners nor can they receive visitors or participate in leisure activities or have free time. Health professionals identify prisoners who are complacent about their TB treatment and use the strategy of persuasion to initiate their treatment. They persuade prisoners to accept the necessary isolation based on the argument that isolation is not such a negative situation, because they can benefit from the care and availability of the nursing professionals whenever they wish:

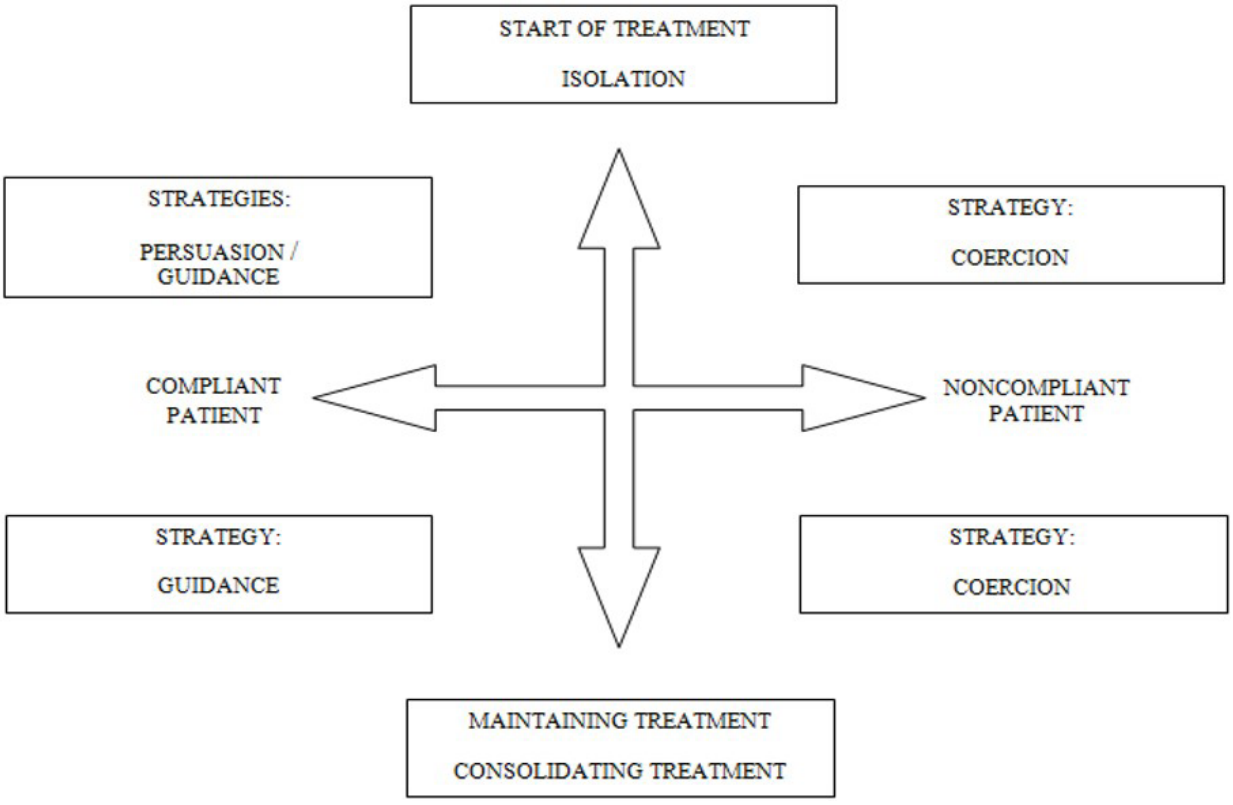

Figure 1. Strategies developed by health professionals in a prison in the state of São Paulo, according to the time of treatment of the disease and inmate compliance. São Paulo, 2021.
Source: Prepared by the authors.

> […] *We talk to them; we tell them that we are going to be at their disposal [...] and that they will have access to us for at least 15 days* [...] (I4).

Adequate TB control requires isolation and at the beginning of treatment, the inmates cannot choose whether to be isolated. With sick prisoners who are not willing to comply or do not wish to begin treatment, health professionals use the strategy of coercing treatment adherence, as these inmates are forced by the health professionals to start isolation in the infirmary and comply with the treatment on an outpatient basis.

Coercion means that professionals pressure prisoners to influence their will and behavior; through coercion, they emphasize and impress upon them the consequences of not initiating treatment, such as restricted leisure activities or free time and/or losing their visitation rights. Bacilloscopy tests should be performed at the start of treatment so that the inmates do not lose these benefits, as pointed out by this participant:

> […] *They can only leave isolation when they begin treatment and the bacilloscopy test comes out negative* [...] (I1).

They also emphasize the consequences of nontreatment on the inmates' health, explicitly mentioning the possibility of death by TB, as expressed by this participant.

> *"We warn them that TB is a lethal disease if it is not treated properly."* (I6).

While in isolation, professionals are in close contact with patients for at least 15 days, providing then DOT. Isolation offers professionals the opportunity to develop an orientation strategy regarding care and treatment, educating prisoners on the proper intake of medication that they should perform during their outpatient treatment when returning to their cells without DOT.

In the process of outpatient treatment, professionals understand that it is necessary to engage and hold patients responsible for adhering to treatment. To this end, they continue with the strategy of providing orientation about care and the importance of treatment. In addition, they know that prisoners have habits that can harm treatment and their health, so it is necessary to guide them about healthier habits, such as not using or decreasing the drug use and thus being cured much more easily.

However, outpatient treatment adherence is not always easy to achieve. When professionals notice that a patient is not

carrying out the treatment and the orientation about their care is not effective, they know they cannot force prisoners to comply with the treatment, so they again resort to the coercion strategy.

For professionals, the most important thing is to cure sick inmates and to interrupt the TB chain of transmission and thus control the disease. The professionals are not complacent with prisoners who do not want treatment, which leads them to resort again to coercion, threatening the patient to return them to isolation and to keep them there until they agree to initiate treatment.

> […] *Getting totally cured is the part of treatment* [taking the medication]. *But now, when these cases emerge* [inmates who don't want to get treated] *we bring them here into the infirmary, and unless they start proper treatment, they aren't free to go back living with the other prisoners.* […](I6).

Health professionals claim that coercion is the most aggressive strategy, and they adopt it so as not to let prisoners hinder the process of health care for TB control and thus fulfill their mission of doing their job well.

DISCUSSION

The magnitude of TB in the State of São Paulo prison system is significant; the incidence of TB was greater than 850 cases/100,000 prisoners and reached more than 1,000 cases/100,000 prisoners. This increase may be due to the high number of pulmonary cases, which, possibly, are not diagnosed quickly and/or not properly treated[2]. The presence of relapse and retreatment cases makes it difficult to properly treat sick prisoners in prisons, reflecting a perpetuation of exposure to TB bacillus. This scenario may favor the spread of multidrug-resistant TB, aggravating the problem[17].

The qualitative results provide an overview of the cases identified in a state penitentiary system. However, this study showed that although the studied prison had fewer health professionals than recommended by the Ministry of Health[4], they were concerned with doing their job well when caring for prisoners with TB, carrying out strategies to obtain a rapid diagnosis, and perform the correct treatment of the disease. In addition, all the health professionals who carried out TB control actions were from the field of nursing, as shown by other studies in which nursing professionals are the most involved in TB control in other penitentiaries[18].

The qualitative phase of this study showed that the actions carried out by the professionals in the prison to access the diagnosis of a patient were to investigatethe hidden and manifest symptoms of the disease among the inmates, searching for signs and symptoms when patients have access to the infirmary. These actions are similar to Ministry of Health guidelines for obtaining a diagnosis via outpatient demand[2]. Administering a questionnaire to learn about the signs and symptoms presented by inmates is an action characterized by the Ministry of Health as a strategy to make a diagnosis by active search[2].

It is important to note that, as shown by the qualitative data, professionals cannot always carry out their diagnostic actions due to the security limits imposed on their actions, which make them impossible to be performed. This includes the restricted access of prisoners to the infirmary and the security reasons that limit the professionals' access to prisoners. Furthermore, inpatients depend on security agents granting them access to the infirmary. This reality has also been reported in other countries, such as China, where the services available to the prison population were also subject to the vertical control of the Ministry of Justice, requiring an interface with the health sector[19].

In an environment influenced by relationships of force and power, prisoners depend on the empathy of security officers to grant them the opportunity to transfer to the infirmary[7,9]. This reality can delay diagnosis[9]. Our study described the work carried out by professionals to sensitize security agents and prisoners in order to facilitate diagnosis via an active search for cases and contacts.

These difficulties mentioned by the interviewed professionals may be the same that face professionals in other prisons of the State, which helps explain why, according to the quantitative results, "active search" and "active contact search" accounted for a low percentage of cases diagnosed. These two forms of action are more dependent on good coordination between prison security agents and health professionals.

A study carried out by a nurse from a prison in Spain highlighted the importance of prisoners having access to health professionals, mainly because they can rapidly diagnose the disease, and in some cases, prisons represent the first opportunity for some individuals to access health services[20].

Additionally, these same difficulties of access to health professionals can help explain why a considerable percentage of cases (5.5%) were diagnosed in emergency services, with a possible worsening of the prisoners' health conditions, which require specialized services for a more accurate diagnosis.

For this reason, with the purpose of ensuring faster discovery of cases, especially considering the predominance of pulmonary cases found in the phase I of this study, it is necessary to rethink the TB diagnosis strategies in prisons, such as active and/or latent TB diagnosis at prison intake, isolating inmates in the infirmary when they enter the institution for a period that enables the health staff to carry out the necessary exams to diagnose TB before sending inmates a cell with others.

Nonetheless, rapid diagnosis of TB among prisoners, such as by identifying latent TB, is an important prevention strategy of active TB. With a preventive diagnosis, treatment of latent TB can prevent the development of active disease among inmates susceptible to it[21].

Regarding health conditions, it is common for inmates to present symptoms such as cough in the prison environment is common due to licit and illicit drug addictions, and this does not tend to be recognized as an indication of active TB[9]. In addition, it is worth emphasizing the lack of knowledge of prisoners about aspects related to the disease and its treatment. A study conducted in Ethiopia showed that most of the prisoners interviewed were

unaware of the cause of the disease, associating it with cold wind, the possibility of developing multidrug resistance in cases of non-adherence; and other elements related to the disease, which hindered identification and treatment[22].

Other health problems such as HIV co-infection hinder an accurate diagnosis of TB, presenting similar conditions and characteristic symptoms, such as weight loss and fever[2], which results in lack of TB recognition by sick prisoners. This is why the professionals of the phase II adopted the strategy of investigating manifest symptoms, always paying attention and requesting the TB diagnosis tests for all prisoners, even those who only present one sign and/or symptom suggestive of this disease.

As shown by the quantitative data, more attention must be paid to those co-infected with HIV/AIDS, as there was a downward trend among diagnosed cases, which means that the other prisons in the state of São Paulo do not emphasize testing TB patients for HIV/AIDS. In addition, diagnosing HIV/AIDS in prisoners with TB is important to monitor the implementation of treatment among these patients, since people living with HIV/AIDS present risk factors that hinder completing TB treatment in prisons[23].

The occurrence of TB and HIV/AIDS in prisons deserves special attention. Penitentiary systems in different countries face challenges in offering treatment for one or both diseases. These include lack of provision of specific medications or therapeutic regimens in prisons, structural barriers, and the difficulty of prisoners in disclosing their health status to prison health professionals[24].

Still regarding health conditions, alcoholism and the use of illicit drugs presented an upward trend in the studied period, which points to special needs in the treatment of TB patients, considering that the use of drugs weakens the effectiveness of TB treatment[25]. This factor was mentioned by the professionals interviewed in this study, describing their efforts to maintain the treatment of sick inmates, providing orientation about adopting healthy habits and reducing drug use in order to be cured of TB.

The DOT and orientation about treatment until its completion are the main strategies recommended by the World Health Organization (WHO) for TB patients in prisons, with the goal of providing adequate follow-up and preventing treatment[2]. If performed as recommended by the Ministry of Health and WHO[1,2], the DOT is an important tool to identify cases of individuals that are still sick and whose health condition requires more attention.

According to our qualitative results, the initiation of TB treatment in the prison was performed when patients were isolated in the infirmary. However, the results also showed that the treatment maintenance on an outpatient is basis without the DOT, which differs from that recommended by the Ministry of Health and the WHO, of providing DOT throughout the entire therapeutic scheme. This finding casts doubt on the reliability of the quantitative results, which indicated that DOT was carried out in 90% of cases.

Moreover, in the studied prison, the health professionals were aware that DOT treatment could only be performed during patient isolation in the infirmary, and therefore, they used other strategies such as coercion, which is used in other prisons around the world to try to ensure compliance with the treatment[9].

Other prisons in Brazil and other countries also face difficulties in carrying out the DOT[9,26], lack the necessary human resources[9], and face the challenge of coordinating security teams and inmate access to healthcare teams. Because of these barriers, it is necessary to prioritize DOT in prisons, at least in cases with greater chances of treatment abandonment[20], such as HIV and cases of licit or illicit drug addiction.

According to the quantitative data, in terms of treatment termination, achieving a cure was achievedin 85% of the cases, with an upward trend, while treatment abandonment and non-TB deaths saw a downward trend. The healthcare professionals were involved in doing their jobs well, but they expressed concerns about disease management. It should be noted that the Secretariat of Penitentiary Administration rewards prisons that achieve goals such as the highest percentage of TB cure[4]. Through these motivational initiatives, the secretariat has helped increase the cure of this disease and decrease treatment abandonment.

This study showed the great importance of the commitment of health professionals, above all nursing staff, to achieving TB control in prison. Without the commitment of these professionals to controlling TB, delays in diagnosis and difficulties in treatment compliance represent barriers that can keep existing and perpetuating the difficulties in controlling TB in a prison system.

Limitations of this study include data extraction from secondary sources in phase I, which may contain errors or deleted information. Furthermore, phase II was conducted in one prison, so therefore it is not possible to extrapolate the results to other Brazilian prisons or that of other countries.

Moreover, due to the researchers' obligation to comply with the requirements of the Ethics Committees of the Higher Education Institution and of the Secretariat for Penitentiary Administration, the prison studied in phase II was chosen prior to obtaining the data in phase I. This means that the phase I analyses were performed when the phase II prison had already been selected, which limited further analysis that could guide phase II in other prisons.

CONCLUSIONS AND IMPLICATIONS FOR PRACTICE

This mixed-method study enabled a better understanding of how TB control is developed in a Brazilian prison system. The TB situation in the studied prison system was significant. Most were pulmonary cases that were diagnosed via outpatient demand. Although TB cure presented an upward trend in the period from 2010 to 2016, the presence of HIV/AIDS and the use of licit and illicit drugs represented challenges for diagnosis and treatment. Thus, the commitment of health professionals to constantly developing strategies that enable diagnosis and treatment contributes to controlling TB in these institutions.

However, it must be noted that, in the face of difficulties that lead health professionals to develop the actions for the diagnosis

and treatment identified in the study, further research is needed to understand and implement strategies for TB control that will be most effective in prison systems, with emphasis on the nursing staff, who are the most involved in the control of the disease in these scenarios.

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