Original Article

Tuberculosis in prison and aspects associated with the diagnosis site

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Abstract

Introduction: Tuberculosis (TB) is highly endemic in prison environments, and requires special attention in the population deprived of liberty (PDL). Thus, we aimed to describe the epidemiological situation of TB among PDL in a large municipality of the Brazilian Legal Amazon, from 2012 to 2016, and to identify the factors associated with the site of TB cases notification.

Methodology: Both descriptive and cross-sectional studies were conducted. Sociodemographic, clinical, diagnostic and treatment data of PDL with TB were collected from the National Disease Notification System - SINAN. Data analysis included frequency distribution, Chi-square test, Fisher exact test and residue analysis, with a significance level of 95%.

Results: 256 cases of TB have been notified among PDL in the penitentiary complex situated in the municipality and 100 cases in local health services, such as Primary Health Care units or referral services. Notification in the penitentiary complex was associated with non-X-ray and more than ten contacts identified. An association was found between diagnosis in local health services and female sex, AIDS, alcoholism, illicit drug use, extrapulmonary clinical form, extrapulmonary pulmonary disease, suspected X-ray, sputum smear-negative for diagnosis, HIV positive, culture of sputum not performed/ in progress, DOT ignored/ blank, less than five contacts identified, transfer and others as closure situation.

Conclusions: The results show that intricate TB cases were notified by the local health services. Strategies of surveillance and articulation with these health services seem to contribute to the identification of TB cases among PDL.

Key words: Tuberculosis; prisons; disease notification; epidemiological surveillance.

Introduction

Tuberculosis (TB) is considered the main cause of death among infectious diseases in the world and is highly endemic in prison environments. It requires a special attention in the Population Deprived of Liberty (PDL), since this population belongs to one of the groups most likely to develop TB, with a relative risk 28 times higher of acquiring the disease compared to the general population [1,2].

Penitentiary complexes represent environments of TB propagation due to confinement, which is marked by overcrowded prison cells, unhealthy and inadequate infrastructure conditions, lack of equipment and human resources, difficulties of communication with the health system, misconceptions about the disease, poor performance of unqualified multi-professional teams for detection and management [3-5], as well as failure to accomplish health education for PDL.

In Brazil, in 2017, over 69,500 new cases of TB were reported, of which 10.5% concerned PDL. Having

this in mind, in the same year, the Ministry of Health (MH) presented the National Plan for the End of Tuberculosis as a Public Health Problem, whose 2nd pillar refers to the policies and support system for facing TB in prisons [6].

In this context, notification of cases represents as a tool for surveillance and follow-up of cases, since the reports contain information identifying the patient, the service, clinical and epidemiological data, thus influencing disease control. This background shows the importance of studying TB case notification among PDL as a vulnerable population, to identify barriers in detecting cases onsite and to propose interventional measures for the proper diagnosis of the disease.

Thus, this study aims to describe the epidemiological situation of TB among PDL in a large municipality of the Brazilian Legal Amazon and to identify the aspects associated with the site of TB cases notification.

Methodology

Both descriptive and cross-sectional study was carried out in a municipality located in the Brazilian Legal Amazon.

Characterization of the Penitentiary Complex of the municipality

In the municipality, there are 14 prison units, which constitute a penitentiary complex, of which only two can notify the TB cases at the National Disease Notification System (SINAN). The other ones have the responsibility for monitoring the treatment and updating the data about the TB cases in a Bulletin of Follow-up, which is monthly sent to the Municipal Health Department to notify cases in SINAN and update it. The cases notified in these 12 units are registered as if they were in those two units.

Regarding the health professionals employed, the penitentiary complex of the municipality relies on at least one nurse technician and a nurse, responsible for the attendance, monitoring, and surveillance of the cases. Besides, only one doctor is available at the entire prison complex during the daytime, in charge of making visits once a week in each prison unit. It is important to mention that there is no health team responsible for the inmates under semi-open sentence.

Outside of the prison environment, the municipality counts on the support of outpatient clinics for following-up the treatment of the patients with extrapulmonary TB and coinfection with HIV; a support of the tertiary level is sometimes necessary for drug-resistant TB (TB-DR) or cases with complications of the disease. However, all this support depends on the prior scheduling of the PDL transportation and the availability of police escort, limitations that confine the treatment to the penitentiary complex.

For the diagnosis of TB among PDL, the prison units are supported by a state laboratory for sputum cultures and sensitivity tests, and a municipal laboratory for the Rapid Molecular Test for TB (RMT-TB). The sputum smear microscopies of the PDL are performed in one of the prison units of the complex since it has had a laboratory since 2009.

Study population

All PDL notified with TB in SINAN in the period between 2012 and 2016 and that lived in the municipality of the study were included. Those whose treatment outcome was unknown were excluded from the study.

Data collection and analysis procedure

Data were collected from the SINAN, which were available by the Municipal Health Secretary. These data refers to socio-demographic variables (sex, age, race/skin color, schooling), clinical and diagnostical information (year of case notification, type of case, clinical presentation of TB, sputum smear microscopy, anti-HIV, sputum culture, RMT-TB, sensitivity test and associated diseases), management of contacts and treatment control (sputum smear microscopy, Directly Observed Treatment (DOT), time of treatment and outcome).

Table 1. Distribution of people deprived of liberty and with the diagnosis of tuberculosis, according to sociodemographic characteristics and the site of TB notification, Brazilian Legal Amazon municipality, 2012-2016.

Sociodemographic characteristics		Site of TB notification			
		Total N (%)	Penitentiary complex N (%)	Others services* N (%)	p
Sex	Male	345 (96.9)	254 (99.2)	91 (91.0)	**0.000****
	Female	11 (3.1)	2 (0.8) -	9 (9.0) +	
Age group	< 25 years	97 (27.2)	70 (27.3)	27 (27.0)	0.994
	25 a 30 years	148 (41.6)	106 (41.4)	42 (42.0)	
	> 30 years	111 (31.2)	80 (31.3)	31 (31.0)	
Skin color/ethnicity	Brown	290 (81.5)	213 (83.2)	77 (77.0)	0.374
	Others	53 (14.9)	34 (13.3)	19 (19.0)	
	Ignored/ blank	13 (3.6)	9 (3.5)	4 (4.0)	
Schooling	Illiterate	11 (3.1)	9 (3.5)	2 (2.0)	0.084
	1 to 4 years of study	67 (18.8)	41 (16.0)	26 (26.0)	
	5 to 8 years of study	191 (53.7)	146 (57.0)	45 (45.0)	
	> 8 years of study	40 (11.2)	25 (9.8)	15 (15.0)	
	Ignored/ blank	47 (13.2)	35 (13.7)	12 (12.0)	
TOTAL		**356 (100,0)**	**256 (100.0)**	**100 (100.0)**	

Source: SINAN, 2018; * Others services: Primary Health Care Units (Family Health Units or Basic Health Units), Emergency Medical Services, Center of Specialized Medicine and Municipal Health Secretariat; ** Fisher exact.

Table 2. Distribution of people deprived of liberty and with the diagnosis of tuberculosis, according to case characteristics and the site of TB notification, Brazilian Legal Amazon municipality, 2012-2016.

Case characteristics			Site of TB notification			
			Total N (%)	Penitentiary complex N (%)	Others services* N (%)	p
Year of notification	2012		58 (16.3)	42 (16.4)	16 (16.0)	
	2013		47 (13.2)	34 (13.3)	13 (13.0)	
	2014		69 (19.4)	51 (19.9)	18 (18.0)	0.921
	2015		74 (20.8)	50 (19.5)	24 (24.0)	
	2016		108 (30.3)	79 (30.9)	29 (29.0)	
Case type	New case		258 (72.5)	187 (73.0)	71 (71.0)	
	Reentry after abandonment/ Relapse		84 (23.6)	58 (22.7)	26 (26.0)	0.708
	Transfer		14 (3.9)	11 (4.3)	3 (3.0)	
Clinical TB presentation	Pulmonary		327 (91.8)	247 (96.5)	80 (80.0)	
	Extrapulmonary		23 (6.5)	8 (3.1) [-]	15 (15.0) [+]	**0.000**
	Pulmonary + extrapulmonary		6 (1.7)	1 (0.4)	5 (5.0) [+]	
Associated diseases and Illnesses	Aids	No	258 (72.5)	187 (73.1)	71 (71.0)	
		Yes	21 (5.9)	9 (3.5)	12 (12.0) [+]	**0.006**
		Ignored/ blank	77 (21.6)	60 (23.4)	17 (17.0)	
	Alcoholism	No	298 (83.7)	218 (85.2)	80 (80.0)	
		Yes	28 (7.9)	10 (3.9) [-]	18 (18.0) [+]	**0.000**
		Ignored/ blank	30 (8.4)	28 (10.9)	2 (2.0) [-]	
	Diabetes	No	325 (91.3)	227 (88.7)	98 (98.0)	
		Yes	4 (1.1)	2 (0.8)	2 (2.0)	**0.002**
		Ignored/ blank	27 (7.6)	27 (10.5)	0 [-]	
	Mental disease	No	321 (90.2)	223 (87.1)	98 (98.0)	
		Yes	7 (2.0)	6 (2.4)	1 (1.0)	**0.006**
		Ignored/ blank	28 (7.8)	27 (10.5)	1 (1.0) [-]	
	Use of illicit drugs	No	138 (38.8)	102 (39.8)	36 (36.0)	
		Yes	35 (9.8)	16 (6.3)	19 (19.0) [+]	**0.001**
		Ignored/ blank	183 (51.4)	138 (53.9)	45 (45.0)	
	Smoking	No	136 (38.2)	87 (34.0)	49 (49.0)	
		Yes	38 (10.7)	32 (12.5)	6 (6.0)	**0.017**
		Ignored/ blank	182 (51.1)	137 (53.5)	45 (45.0)	
	Others**	No	306 (86.0)	218 (85.2)	88 (88.0)	
		Yes	19 (5.3)	11 (4.3)	8 (8.0)	0.065
		Ignored/ blank	31 (8.7)	27 (10.5)	4 (4.0)	
TOTAL			**356 (100,0)**	**256 (100.0)**	**100 (100.0)**	

Source: SINAN, 2018; * Others services: Primary Health Care Units (Family Health Units or Basic Health Units), Emergency Medical Services, Center of Specialized Medicine and Municipal Health Secretariat; ** Others: Psoriasis, Colostomy, Illicit drug use (Drug abuse, drug addiction) Hypertension, Smoking, HIV.

Table 3. Distribution of people deprived of liberty and with the diagnosis of tuberculosis, according to the site of TB notification and the exams performed for diagnosis, Brazilian Legal Amazon municipality, 2012-2016.

Exams performed for diagnosis		Site of TB notification			
		Total N (%)	Penitentiary complex N (%)	Others services* N (%)	p
X-ray	Did not accomplish	203 (57.0)	195 (76.2) [+]	8 (8.0) [-]	**0.000**
	Suspect	146 (41.0)	58 (22.6) [-]	88 (88.0) [+]	
	Normal/ Other pathology	7 (2.0)	3 (1.2)	4 (4.0)	
Sputum smear microscopy	Positive	247 (69.4)	184 (71.9)	63 (63.0)	**0.000**
	Negative	68 (19.1)	37 (14.4)	31 (31.0) [+]	
	Did not accomplish / Does not apply	41 (11.5)	35 (13.7)	6 (6.0)	
Anti HIV	Negative	256 (71.9)	186 (72.7)	70 (70.0)	**0.000**
	Positive	23 (6.5)	9 (3.5)	14 (14.0) [+]	
	Did not accomplish/ In progress	77 (21.6)	61 (23.8)	16 (16.0)	
Sputum culture	Did not accomplish/ In progress	246 (69.1)	160 (62.5)	86 (86.0) [+]	**0.000**
	Positive	83 (23.3)	73 (28.5)	10 (10.0) [-]	
	Negative	27 (7.6)	23 (9.0)	4 (4.0)	
**RMT-TB ** **	Did not accomplish/ blank	123 (67.6)	84 (65.2)	39 (73.6)	0.057
	Detectable and sensitive to Rifampicin	48 (26.4)	40 (31.0)	8 (15.1)	
	Not detectable	7 (3.8)	3 (2.3)	4 (7.5)	
	Inconclusive	4 (2.2)	2 (1.5)	2 (3.8)	
Sensitivity test	Did not accomplish/ blank/ In progress	333 (93.5)	237 (92.6)	96 (96.0)	0.460
	Sensitive	22 (6.2)	18 (7.0)	4 (4.0)	
	Resistant to Isoniazid	1 (0.3)	1 (0.4)	0	
TOTAL		**356 (100,0)**	**256 (100.0)**	**100 (100.0)**	

Source: SINAN, 2018; * Others services: Primary Health Care Units (Family Health Units or Basic Health Units), Emergency Medical Services, Center of Specialized Medicine and Municipal Health Secretariat; ** The period from 2015 to 2016 was considered, with n = 129 cases in the penitentiary complex, and n = 53 cases in other services, due to the implantation of the RMT-TB to diagnose TB in the municipality in 2015.

Table 4. Distribution of people deprived of liberty and with the diagnosis of tuberculosis, according to the site of TB notification and the treatment characteristics, Brazilian Legal Amazon municipality, 2012-2016.

Treatment characteristics		Site of TB notification			
		Total N (%)	Penitentiary complex N (%)	Others services* N (%)	P
DOT	No	318 (89.3)	237 (92.6)	81 (81.0)	
	Yes	23 (6.5)	13 (5.1)	10 (10.0)	**0.003**
	Ignored/ blank	15 (4.2)	6 (2.3)	9 (9.0) [+]	
Treatment duration	< 6 months	172 (48.3)	119 (46.5)	53 (53.0)	
	6 months	122 (34.3)	87 (34.0)	35 (35.0)	0.223
	> 6 months	62 (17.4)	50 (19.5)	12 (12.0)	
Treatment outcome	Cure	244 (68.5)	193 (75.4)	51 (51.0) [-]	
	Abandonment	77 (21.6)	55 (21.5)	22 (22.0)	
	Transfer	28 (7.9)	6 (2.3) [-]	22 (22.0) [+]	**0.000**
	Others**	7 (2.0)	2 (0.8)	5 (5.0) [+]	
Monthly Sputum Smear Microscopy					
1st month	Did not accomplish	282 (79.2)	200 (78.1)	82 (82.0)	
	Negative	54 (15.2)	42 (16.4)	12 (12.0)	0.579
	Positive	20 (5.6)	14 (5.5)	6 (6.0)	
2nd month	Did not accomplish	277 (77.8)	193 (75.4)	84 (84.0)	
	Negative	77 (21.6)	63 (24.6)	14 (14.0)	**0.008**
	Positive	2 (0.6)	0	2 (2.0)	
3rd month	Did not accomplish	289 (81.2)	207 (80.9)	82 (82.0)	
	Negative	66 (18.5)	49 (19.1)	17 (17.0)	0.252
	Positive	1 (0.3)	0	1 (1.0)	
4th month	Did not accomplish	284 (79.8)	206 (80.5)	78 (78.0)	0.602
	Negative	72 (20.2)	50 (19.5)	22 (22.0)	
5th month	Did not accomplish	278 (78.1)	196 (76.6)	82 (82.0)	0.264
	Negative	78 (21.9)	60 (23.4)	18 (18.0)	
6th month	Did not accomplish	242 (68.0)	166 (64.8)	76 (76.0)	**0.042**
	Negative	114 (32.0)	90 (35.2)	24 (24.0)	
TOTAL		**356 (100,0)**	**256 (100.0)**	**100 (100.0)**	

Source: SINAN, 2018; * Others services: Primary Health Care Units (Family Health Units or Basic Health Units), Emergency Medical Services, Center of Specialized Medicine and Municipal Health Secretariat; ** Others: change in diagnosis, death due to TB, death due to other causes and TB-DR.

Data were firstly analyzed by frequency distribution. To identify the association between the site of notification (penitentiary complex and other health services) of TB among PDL and the other variables of the study, the Chi-square test, Fisher exact test was performed.

When the results of both tests pointed to a statistically significant association between the variables, the pattern of interdependence among them was tested by residual frequencies (difference between observed and expected frequency) in a standardized and adjusted form, so that residues above 1.96 or below -1.96 indicated, respectively, a significant positive or negative association between the variables. For all tests, a significance level of 95% was adopted.

Ethical aspects

In compliance with the recommendations of Resolution 466/12 of the National Health Council [7], the project was approved by the Research Ethics Committee, according to protocol 2,399,327.

Results

In the period from 2012 to 2016, 2,400 TB cases were notified in the municipality, of which 361 (15.0%) were PDL in the penitentiary complex of the municipality. Of these cases, seven were excluded because their treatment outcome was blank. So, 356 cases of TB in the PDL were analyzed, of which 256 (71.9%) were notified in the penitentiary complex and 100 (28.1%) in other health services in the municipality.

The majority of PDL with TB in the municipality were male (96.9%), 25 to 30 years old (41.6%), self-declared brown (81.5%) and five to eight years of study (53.7%). Female sex is significantly associated with TB notification in other health services (Table 1).

The majority of cases were notified in 2016 (30.3%) and the majority of them were new cases (72.5%), diagnosed as pulmonary TB (91.8%) with the following

associated diseases: AIDS (27.5%), alcoholism (17.3%), diabetes (8.7%), mental illness (9.8%) and others (14.0%). Respectively, data of 51.4% and 51.1% of cases were ignored for illicit drug use and smoking. A significant association was found between notification in other services with extrapulmonary TB, both extrapulmonary/pulmonary TB, AIDS, alcoholism, illicit drug use (Table 2).

Medical examination showed that 69.4% of the results were positive for sputum smear microscopy at the time of diagnosis and 71.9% were negative for HIV. Most cases did not perform X-ray (57.0%) and sputum culture (69.1%). RMT-TB and sensitivity tests were unrealized/blank/in progress in 67.6% and 93.5% of cases, respectively. Notification in other services were significantly associated with suspect X-ray, negative sputum smear in diagnosis, positive anti-HIV test and not performed/in progress culture of sputum. The notification of TB cases in the penitentiary complex was positively associated with not accomplished X-ray (Table 3).

Only 10.7% were subjected to DOT and 48.3% had less than six months of treatment duration. The cure rate was 68.5% and treatment default 21.6%. The sputum smear microscopy for monthly follow-up was not performed in most months and a positive sputum smear was observed until the third month of treatment in 0.3% of cases. An association was found between notification in other services with DOT ignored/blank and transference or others as treatment outcomes (Table 4).

Less than five contacts were identified in 41.8% of the participants and zero contacts were examined in 66.6% of them.

Notification in other services presented the association with less than five contacts identified and the notification of TB in the penitentiary complex was positively associated with more than ten contacts identified (Table 5).

Table 5. Distribution of people deprived of liberty and with the diagnosis of tuberculosis, according to the site of TB notification and the contact control, Brazilian Legal Amazon municipality, 2012-2016.

| Contact control | | Site of TB notification | | | P |
		Total N (%)	Penitentiary complex N (%)	Others services* N (%)	
Identified contacts	< 5 contacts	149 (41.8)	80 (31.3) -	69 (69.0) +	**0.000**
	5 to 10 contacts	116 (32.6)	91 (35.5)	25 (25.0)	
	> 10 contacts	91 (25.6)	85 (33.2) +	6 (6.0) -	
Examined contacts	0 contacts	237 (66.6)	166 (64.8)	71 (71.0)	**0.001**
	1 to 7 contacts	64 (18.0)	40 (15.7)	24 (24.0)	
	> 7 contacts	55 (15.4)	50 (19.5)	5 (5.0) -	
TOTAL		**356 (100,0)**	**256 (100.0)**	**100 (100.0)**	

Source: SINAN, 2018; * Other services: Primary Health Care Units (Family Health Units or Basic Health Units), Emergency Medical Services, Center of Specialized Medicine and Municipal Health Secretariat.

Discussion

Most TB cases among PDL in the municipality were notified within the prison complex, which shows the potential of these locations to diagnose and report cases, even though in most cases the diagnosis depends on limited access to health service, security, internal organization, supply and quality of service [8,9] as well as insufficient infrastructure and human resources.

Regarding the PDL profile, several studies report the presence of TB in penitentiary complexes as being predominantly related to males, economically active, low schooling, and brown skin-color individuals [10,11] which is in agreement with the findings of this study. However, higher number of notifications of female patients in other services implies structure-related gaps and poor organization of health care in female prisons, such as the need for laboratory support and a lower number of health teams compared to male prisons, as well as weaknesses in health care access.

Regarding the clinical profile of PDL, there is a predominance of new cases with pulmonary TB [9,12], which also occurs in this study. These results serve as an alert for the prison units of the municipality since such patients act as a source of transmission of the disease [9], mainly because they live in overpopulated cells and are frequently exposed to the bacillus of the disease [6,13].

The association between the notification in other services and extrapulmonary TB, pulmonary/extrapulmonary TB, AIDS, alcoholism and use of illicit drugs suggests the severity of cases and the limits of prison units in TB diagnosis in these kinds of cases. However, it is important to mention that prisons are aware of their limitations regarding the severity of the cases, as well as the establishment of arrangements and communication with the community health services to meet these demands outside the prison complex.

Even though the majority of the PDL in the study did not have associated diseases and illnesses, special attention should be given to people with AIDS, alcoholism and diabetes, which are risk factors for active TB and latent TB infection (LTBI). These factors are exacerbated in an unhealthy environment with inadequate ventilation, lighting, and food [14,15].

It was found that the majority of the PDL in this study did not perform X-ray for diagnosis and only some of them went to the rear services to carry out the examination. This reveals weaknesses in the availability of the equipment and the network for TB screening, which can be caused by the limited financial and human resources present in most penitentiary complexes [10,16]. These results reveal the need to acquire radiological equipment, fixed or mobile, since some studies demonstrate that annual radiological screening, other than symptom-based one, has been used to identify suspected cases of TB and played an important role in the reduction of the disease incidence and prevalence in prisons [11,17].

Moreover, radiological screening can be also done at the time of admission in prison, providing timely TB diagnosis and immediate treatment and making it possible to establish preventive measures before cases have contact with the other inmates [15,18-20].

Regarding to sputum smear microscopy, one study [21] identified that treatment default and death rates were highest in PDL who did not perform this test at the time of diagnosis, since the lack of a sputum smear result contributes to the delay in disease detection, leading to unfavorable outcomes, such as those found in this study, when compared to the goals established by the World Health Organization for cure and abandonment of at least 85% and up to 5%, respectively [2].

Other result is related to the association of negative sputum smear microscopy with the notification in other services in this study and can be explained by the higher percentage of people diagnosed with extrapulmorary TB and coinfection with AIDS by these services, situations that can lead to negative results. The association between TB reporting by these services and positive anti-HIV and sputum culture testing again reveals the severity of cases that are diagnosed outside the prison unit, and suggests the need to establish routines and sample flows between the penitentiary complex and the laboratory network for the clinical management of TB in order to guarantee the result of the examination within 24 hours and early onset of treatment [6].

To minimize TB transmission between PDL, active TB screening should be required, using sputum culture in case detection protocols [10,19]. Although it is also recommended by the Ministry of Health, a high percentage of unperformed sputum cultures was observed, similar to what happened in most developing countries, as Brazil [22]. This result contributes to the underreporting of TB-DR cases, lack of knowledge of the resistance profile, increasing in morbidity and mortality and proliferation of resistant strains [22]. This is a result of poor communication with the laboratory network to search for culture samples, the delayed examination results, which consequentially delays the request for culture in the routine of the penitentiary complex, as well as the obstacles to access them by the

PDL, which influences the request for chest radiography.

In addition, considering the increased incidence of TB-DR cases, it is possible to verify the occurrence of transmission of genetically similar strains inside the prison cells [5], as well prevent inadequate treatments and late detection of the cases. It is therefor very important that health care workers request the sputum culture and the sensitivity tests [23].

The RMT-TB comprises a high specificity test and can be used simultaneously with the other screening tests since it allows a fast result in TB diagnosis and the detection of sensitivity to rifampicin. These tests cost more than the smear sputum microscopy and are acompanied with various challenges in all prison units [20]. These challenges involve the correct use of the test due to deficiency of kits to perform it, weaknesses in the organization of the collection flow and referral to the laboratory, and lack of health professionals knowledgeable about the characteristics and importance of the test.

Although DOT is recognized as a key element for strengthening TB treatment adherence, prevention of DR-TB, reduction of unfavorable outcomes and to increase cure rate [21,24], a high percentage of cases were under self-administered therapy on prison units, which confirms the results of another study that found failures in implementing measures for TB control in these scenarios, which include the DOT [24].

For the accomplishment of DOT, there is a need for better communication between the health staff and the prison guards for case surveillance and supervision of medication intake, since guards are in constant contact with PDL. Therefore, this communication is fundamental for the effective implementation of strategies for screening and case management, since these professionals have the responsibility for the interface between health actions and the security representatives and the support network [22] and can contribute to the control of TB in penitentiary complexes and outside it.

Also worth mentioning is the high rate of treatment default among PDL, which implies social and epidemiological consequences, such as the increase of recurrences and re-admission after default, drug resistance, the persistence of the disease transmission chain, poor prognosis and increase in treatment time and costs [9]. In addition to this, for individuals with semi-open sentence, there is a lack of co-responsibility of the PHC team for the continuity of treatment and the absence of a health care team in prison units to follow up these cases, resulting in treatment interruption and

maintenace of transmission [25], as well as an increase in the percentage of cases with drug resistance.

The surveillance of diagnosed TB cases is questionable, since sputum smear microscopy for monthly control was not performed in most of the months, after having been positive until the third month. In this way, deficiencies are identified in the follow-up of these cases, sustained by the implementation of empirical treatmentand the lack of access to the exams for monthly control [24].

Given the need for diagnosis in the support network, the lack of financial and human resources, weaknesses between the coordination of justice and health services and difficulty in accessing the supporting services are obstacles that affect the health team itself. This leads to unfavorable evolution of cases and increased transmission of TB [25].

Additionally, there is a difficulty of a propper follow up for administrative reasons, transfers between prisons, disciplinary isolation and the very lifestyle of these individuals who are often involved in violence, escape and rebellion, which makes adherence difficult and consequently, contributes to treatment abandonment [10,21,26].

Thus, even if access to health actions and services should be the guaranteed to PDL, by a shared responsibility between the Ministry of Justice and MH, in partnership with the Secretaries of Health and Justice at the state and municipal levels [6], it appears that justice and health end up being antagonistic in the process of care for these TB patients.

In this sense, it is observed that in most cases there is a prioritization of safety over health, which hinders actions within the penitentiary complexes , such as health team access to cells, evaluation of contacts, DOT, programs to control drug abuse and smoking, as well as continuing education for prison workers, which could contribute to reducing the incidence of TB and morbidity in these settings [5,6,14,27].

It should be noted that the PDL receive visits from family, friends and have constant communication with local staff, which make them important sources of the disease, with the risk of dissemination to the population inside and outside of prison[15,16]. Once there is an association between the cases notified by the penitentiary complex and more than ten contacts identified, the investigation of contacts emerges as a strategy to disease control. For PDL, contacts are individuals who live with the TB cases in the same cell or gallery and they have to be screened with sputum smear microscopy regardless of the cough duration, chest X-ray if available [6] and tuberculin skin test,

which detects people with LTBI and prevents the development of active TB [28].

The presented situation and challenges regarding adequate diagnosis, high hate of treatment default, constant inmate transfers, prisons conditions, and weaknesses in establishing disease control measures provide a perfect environment for the maintenance of the TB transmission chain in the penitentiary complexes [18,19]. Thus, considering that PDL are under the protection of the State, access to diagnosis and follow-up of cases should be improved, not as a privilege or an act of compassion, but as a constitutional right [9].

Conclusion

This study revealed a high number of cases being notified by the penitentiary complex. However, weaknesses of prison units in diagnosing TB cases in women were identified, as well as in cases with higher severity of the disease, showing the necessity of communication with other services for the diagnosis of these cases. The study also points out challenges to be faced by prisons to perform X-ray, culture and RTM tests to diagnose cases. Regarding treatment, there was a low performance of DOT and monthly follow-up examinations in both cases notified in the prison complex and in those notified in other services, which may have contributed to the low cure rate and high treatment abandonment rate. There were also a high number of contacts identified between the cases notified in the prison complex and a low number of cases examined among the cases notified in both services.

These challenges are accompanied by the lack of resources, prioritization of expenses in safety activities other than in health ones and undervaluation of TB in these environments. Therefore it is necessary to implement strategies to qualify services for the cases surveillance, such as active case finding, enhance detection among spontaneous demand, strengthen the human resources capacity for TB control, onsight laboratory support, increase the coverage of DOT and the follow-up of PDLs with semi-open sentence. All of this, in addition to communication with the other services of the health care network, can contribute to the control of the disease in penitentiary complexes and, consequently, lead to favorable treatment outcomes, as the cure.

Since this is a study based on secondary data, it is worth noting some limitations such as duplicities, underreporting of cases and incomplete data, especially the notifications from other health services in the municipality, regarding variables related to associated diseases and illnesses and contact control.

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