

## Treatment Outcomes of Brazilian Inmates with *Treponema pallidum* and Human Immunodeficiency Virus Infection: A Prospective Cohort Study

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**Abstract.** A prospective cohort study was conducted to evaluate the incidence and treatment outcomes of syphilis and human immunodeficiency virus (HIV) in inmates from Central Brazil. In 2013, 3,363 inmates from 12 prisons in the state of Mato Grosso do Sul were recruited, and 1,614 remained incarcerated after 1 year. The inmates were interviewed, and blood samples were collected for serological testing for *Treponema pallidum* and HIV infections. Inmates infected with *T. pallidum* or HIV within the first year were assessed for treatment using prison medical record data, based on Venereal Disease Research Laboratory test results, HIV-1 viral load, and CD4 counts. Acquired syphilis was identified in 5.8% ( $N = 95$ ) of the inmates and 74% ( $N = 70$ ) of them demonstrated poor treatment outcomes after 1 year. Multivariate analysis revealed that not reporting a stable partner was a risk factor for failure of syphilis treatment. Twenty-five patients had HIV (1.5%) and among those, 13 (52%) had an HIV-1 viral load > 200 copies/mL after 1 year. The incidence of *T. pallidum* and HIV infections was 0.5% ( $N = 9$ ). The poor treatment outcomes of syphilis and HIV within Brazilian prisons demonstrate the inadequacy of public health programs. Although the incidence of these infections within the prison population is low, new cases still occur. Our results reinforce the significance of screening programs during prison admission for early detection and treatment of sexually transmitted infections.

### INTRODUCTION

Syphilis is an infectious disease caused by *Treponema pallidum*, which is primarily transmitted vertically (congenital syphilis) or through unprotected sex.<sup>1,2</sup> Syphilis is of great epidemiological importance because of its relationship to high perinatal morbidity and mortality. The disease continues to be a predominant cause of adverse pregnancy events, including a significant number of premature births, stillbirths, and congenital malformations.<sup>2,3</sup> According to the World Health Organization, 937,000 new cases of syphilis are recorded in Brazil annually,<sup>4</sup> which represents 1% of new cases in the world.<sup>5</sup>

The presence of certain sexually transmitted infections (STIs), such as syphilis, increases the risk of human immunodeficiency virus (HIV) transmission, especially among populations with high-risk behaviors, such as inmates.<sup>1,6</sup> Syphilis can negatively impact HIV viral load and CD4 cell counts in HIV-infected patients.<sup>7,8</sup> Furthermore, since the discovery of acquired immunodeficiency syndrome (AIDS), governmental and nongovernmental organizations have increasingly expressed interest in the diagnosis, treatment, and prevention of HIV.<sup>1,6</sup>

Inmates in Brazil are predisposed to STIs because they are subjected to conditions favorable for the spread of these infections, including overcrowding, promiscuity, the use of illicit drugs and sharing needles or other sharp objects, multiple sex partners, unprotected sex, and tattooing under

unsafe conditions. In addition, prison staff often lack proper training and prisons do not have access to high-quality health services.<sup>9–12</sup> The high rate of syphilis and HIV among inmates identifies prisons as potential sites for sentinel surveillance.<sup>9–11,13,14</sup>

The gradual increase in the world's prison population has a significant impact on the STI epidemic among the general population. Brazil has the fourth largest prison population in the world, with 607,700 individuals incarcerated in penal institutions. In addition, the state of Mato Grosso do Sul has the highest rate of incarceration predominantly because of drug-trafficking crimes.<sup>15</sup> Given the lack of STI prevention policies in Brazilian prisons, this study aimed to determine the incidence of syphilis and HIV and evaluate treatment outcomes among Mato Grosso do Sul inmates.

### METHODS

**Study setting and population.** Mato Grosso do Sul is a state in Central-West Brazil that borders Paraguay and Bolivia. The state has the highest incarceration rate in the country, with 569 inmates per 100,000 individuals.<sup>15</sup> In 2014, the state had 15,513 inmates distributed among 44 penal institutions, with a total of 9,913 in 23 “closed” system penal institutions for greater risk offenders.<sup>15,16</sup> Twelve closed prisons in the state's five largest cities (Campo Grande, Corumbá, Dourados, Ponta Porã, and Três Lagoas) were included in this prospective cohort study conducted from January 2013 to December 2014, with 7,221 inmates representing 73% of the closed system population and 59% of the state's total prison population (Figure 1). Of the 12 closed prisons, eight were male prisons (6,552 inmates) and four were female prisons (669 inmates). Proportional stratification was performed using each prison as a unit of randomization. The study included inmates aged 18 years or older who consented to participate.

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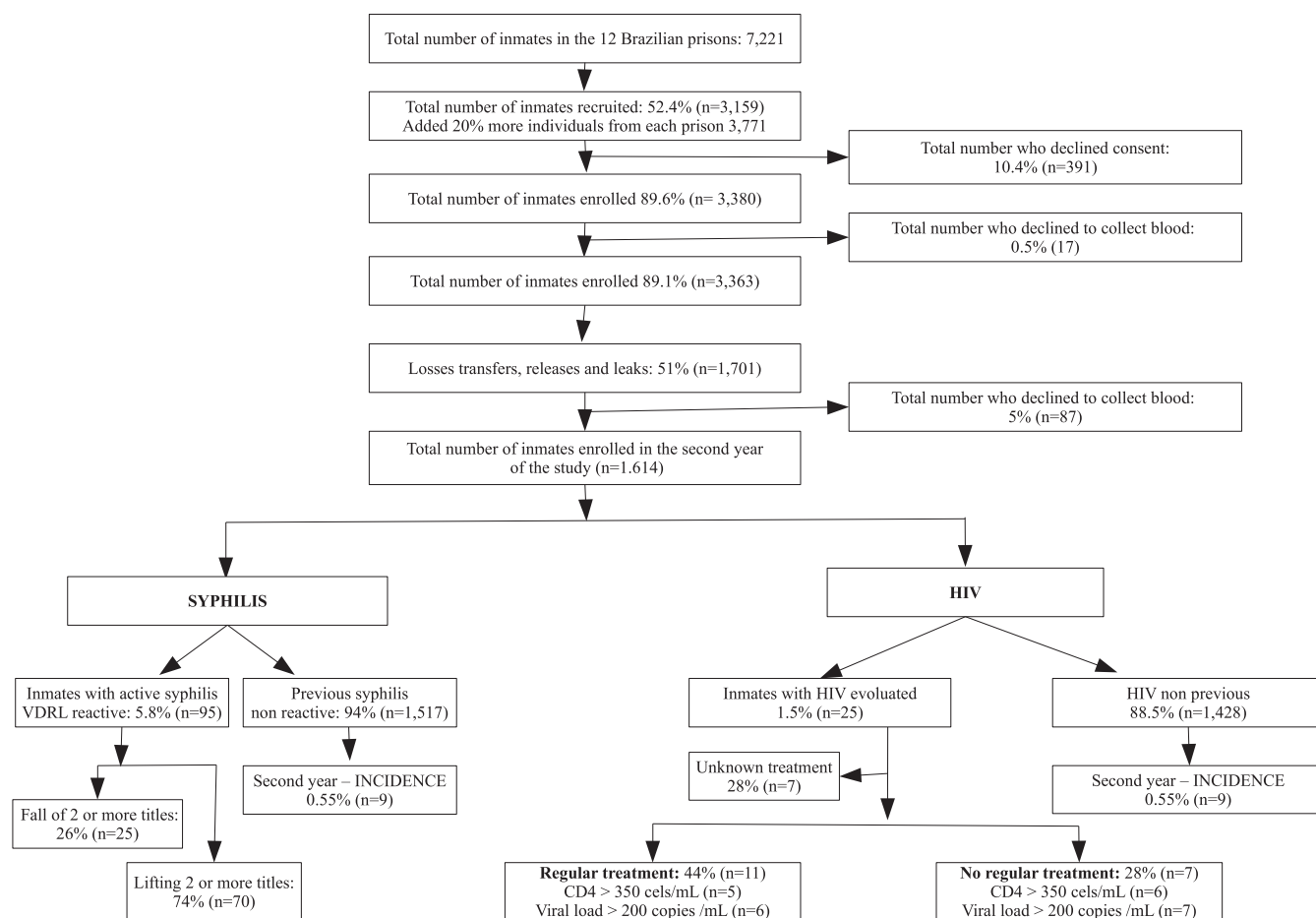


FIGURE 1. Flow chart demonstrating the study design, screening process, and number of cases detected with and treated for syphilis and human immunodeficiency virus (HIV).

In 2013, 3,363 inmates from 12 prisons in the state of Mato Grosso do Sul were recruited and 1,614 remained incarcerated after 1 year (Figure 1). The study consisted of three stages using the following data collection tools: 1) an interview using a standardized questionnaire with objective and subjective questions about demographic and sexual behavior, 2) blood samples to perform serological tests for *T. pallidum* and HIV infections, and 3) medical charts of inmates to evaluate the treatment outcomes.

**Data and blood collection.** Each participant was interviewed using a standard questionnaire. The variables included age, gender, marital status, educational level, drug use, sexual history, STIs, history of blood transfusion, tattoos, previous surgeries, self-reported mental illness, previous incarceration, and length of imprisonment. The participant's race (white, black, indigenous, Asian, or mixed) was self-reported. After appropriate antisepsis, 10-mL samples of peripheral venous blood were obtained using a vacuum tube system. The samples were processed to obtain the serum and stored at  $-20^{\circ}\text{C}$  until the serological assays were performed.

**Serological testing of syphilis and HIV infections.** The presence of *T. pallidum* infection was determined using an enzyme-linked immunosorbent assay (ELISA) (ICE Syphilis; DiaSorin, Dartford, United Kingdom). Enzyme-linked immunosorbent assay-reactive samples were serially diluted to quantify titers of syphilis anticardiolipin antibodies using the Venereal Disease Research Laboratory (VDRL) test (Abbott

Murex, Dartford, United Kingdom). Patients were considered to have acquired syphilis when the ELISA and VDRL tests showed positive results.<sup>17</sup> To determine the presence of HIV infection, participants' serum samples were initially screened using a commercial ELISA kit for the detection of antibodies against HIV-1 and HIV-2 (Murex HIV-1.2.0; DiaSorin, Saluggia, Italy). All positive and indeterminate samples were confirmed by performing a western blot assay (Novopath HIV-1, Immunoblot; Bio-Rad Laboratories, Hercules, CA). CD4 counts were obtained using flow cytometry (FacsCalibur, Multitest, Becton Dickinson, San Jose, CA) and HIV-1 viral load was determined by performing Abbott RealTime HIV-1 assays. Individuals with negative tests in 2013, but positive tests in 2014, were considered to be new cases of syphilis and HIV.

**Syphilis treatment.** The titration of VDRL was used to determine treatment success or failure. Treatment was considered successful when the trend of titers decreased by more than two titers or when the titer was negative (VDRL = 0).<sup>2,5,18</sup> Patients whose medical records were not chronicled or were missing were not considered for this analysis.

**Treatment of HIV.** To determine the outcome of antiretroviral therapy in HIV-infected inmates, evaluations of the prison health service, the antiretroviral therapy delivery database Medication Logistics Control System (SICLOM),<sup>19</sup> the databases Laboratory Tests Control System (SISCEL)<sup>20</sup> and the Specialized Treatment Unit (SAE) were conducted. The collected data included results

of laboratory tests such as measurements of HIV-1 viral load and CD4 cell count. Treatment was considered to be therapeutically successful when individuals presented with an HIV-1 viral load < 200 copies/mL in the second year of study.

**Data analysis.** Questionnaire-based data and biological testing results were recorded, double-checked for quality control, and entered into the Research Electronic Data Capture online database. SAS version 9.2 (SAS Institute, Inc., Cary, NC) was used to conduct bivariate and multivariate analyses. Dichotomized and categorical data were analyzed with the  $\chi^2$  test or Fisher's exact test. For continuous variables, the *t*-test or analysis of variance was used. Bivariate logistic regression was applied to verify the association between HIV and sociodemographic factors, self-reported risk factors, and syphilis infection. In the bivariate analysis, variables achieving a prespecified level of significance ( $P < 0.20$ ) were included in the multivariate model. The multivariate model was fitted using stepwise backward logistic regression and the results were expressed as odds ratios (ORs) and adjusted ORs (AORs). The cumulative incidence of syphilis was calculated by dividing all the new cases identified in the second screening period by all the inmates who remained incarcerated for 1 year. Variables related to the successful treatment of syphilis were included in the model if they reached a significance level of  $P < 0.20$ . Statistical significance was determined at  $P < 0.05$ .

**Ethical issues.** This study was conducted with the approval of the research ethics committee of the Universidade Federal da Grande Dourados (number 877,294). All eligible participants provided written informed consent before participation. All participants received the results of their serological tests individually and a physician specializing in infectious diseases prescribed appropriate treatment to those with positive tests. All new cases of syphilis and HIV identified in the study were reported to the notifiable disease database (Sistema de Informação de Agravos de Notificação).

## RESULTS

Of the 7,221 inmates in the 12 closed system prisons, 3,771 were recruited, with 3,363 inmates (89%) being enrolled after providing participation consent. After 1 year, 1,614 participants remained incarcerated in the same prisons; this subset comprises the prospective cohort in which syphilis and HIV incidence and treatment outcomes were assessed (Figure 1). Sociodemographic characteristics, risk behaviors, and prevalence and incidence results are shown in Table 1. Approximately 87% of inmates were male and the mean age was 32 years (standard deviation:  $\pm 10$  years, range: 18–80 years). The majority (65%) of the inmates were from the state of Mato Grosso do Sul; 45% reported less than 4 years of schooling, 46% reported a single marital status, and 50% reported having a steady partner. The self-reported racial groups included white (33%), mixed (50%), black (13%), Asian (2%), and indigenous (1.5%). In this study, 51% of the participants were drug users, 1% were intravenous drug users (IDUs), and 52% were alcohol users. Needle sharing or sharing of other sharp objects was reported by 39% of the participants and sex with multiple partners was reported by 50%. Homosexual preference was identified in 3% of the participants, homosexual intercourse was reported by 8%, sex with non-IDUs was reported by 34%, and sex with IDU was reported by 3%. Irregular condom use was reported by 66% of the participants; history of HIV, hepatitis, or syphilis was reported by

TABLE 1  
Sociodemographic characteristics, sexual behaviors, and incidence results for inmates from 12 Brazilian prisons ( $N = 1,614$ )

Variables	Number/percentage
Syphilis prevalence in the first year	95/1,614 (5.88%)
Syphilis incidence in the second year	09/1,614 (0.55%)
HIV prevalence in the first year	25/1,614 (1.54%)
HIV incidence in the second year	09/1,614 (0.55%)
HIV and syphilis coinfection in the second year	04/1,614 (0.24%)
<b>Sociodemographic</b>	
Age, years, mean $\pm$ SD	32 (18–80)
Marital status, single	741/1,604 (46.2%)
Sex, male	1,410/1,614 (87.36%)
Reside in Mato Grosso do Sul	1,045/1,614 (64.75%)
Illiterate	706/1,580 (44.68%)
<b>Ethnicity</b>	
White	522/1,558 (33.5%)
Mixed	784/1,558 (50.32%)
Black	198/1,558 (12.71%)
Indigenous	23/1,558 (1.48%)
Asian	31/1,558 (1.99%)
<b>Drug/alcohol history</b>	
Alcohol use over the last year	821/1,588 (51.7%)
Drug use over the last year	826/1,614 (51.18%)
IDU over the last year	16/1,569 (1.02%)
Ever shared needles/objects	623/1,614 (38.6%)
<b>Sexual history</b>	
Sexual preference, homosexual	50/1,607 (3.11%)
Previously had homosexual intercourse	120/1,561 (7.69%)
Sex with a drug user	554/1,610 (34.41%)
Absence of sex with an IDU	52/1,614 (3.22%)
Not stable partner	798/1,612 (49.5%)
Sexual partner with HIV, hepatitis, or syphilis	59/1,599 (3.69%)
HIV, hepatitis, or syphilis	52/1,475 (3.53%)
HIV-positive	35/1,614 (2.16%)
Urethral discharge	152/1,614 (9.42%)
Wart in the genital region	33/1,611 (2.05%)
Genital ulcer disease	53/1,609 (3.29%)
<b>Condom use</b>	
Always	539/1,605 (33.58%)
Sometimes/never	1,066/1,605 (66.42%)
<b>Penal institution</b>	
EPFCAJG	40/1,614 (2.48%)
EPFTL	30/1,614 (1.86%)
EPFPP	42/1,614 (2.60%)
EPFIIZ	92/1,614 (5.70%)
EPC	132/1,614 (8.18%)
PTL	118/1,614 (7.31%)
EPRB	129/1,614 (7.99%)
CTAL	53/1,614 (3.28%)
PTCG	117/1,614 (7.25%)
IPCG	235/1,614 (14.56%)
EPJFC	292/1,614 (18.09%)
PHAC	334/1,614 (20.69%)

CTAL = Centro de Triagem Anílio Lima; EPC = Estabelecimento Penal de Corumbá; EPFCAJG = Estabelecimento Penal Feminino Carlos Alberto Jonas Giordano; EPFIIZ = Estabelecimento Penal Feminino Irmã Irma Zorzi; EPFPP = Estabelecimento Penal Feminino de Ponta Porã; EPFTL = Estabelecimento Penal Feminino de Três Lagoas; EPJFC = Estabelecimento Penal Jair Ferreira de Carvalho; EPRB = Estabelecimento Penal Ricardo Brandão; HIV = human immunodeficiency virus; IDU = intravenous drug user; IPCG = Instituto Penal de Campo Grande; PHAC = Penitenciária Harry Amorim Costa; PTCG = Presídio de Trânsito de Campo Grande; PTL = Penitenciária de Três Lagoas; SD = standard deviation.

3.5%; urethral discharge was reported by 9.5%; genital ulcer disease was reported by 3%; and genital warts were reported by 2%.

During the first year, 6% and 1.5% of the inmates were syphilis- and HIV-positive, respectively. In addition, all cases positive for syphilis and HIV were reported to health-care services and appropriate therapy was started in 2013. In the second year, the incidence of syphilis and HIV was 0.5%

each, and 0.24% (four patients) were positive for both syphilis and HIV (Table 1). The treatment outcomes of syphilis and HIV were evaluated 11 months in median after the first prison interview. For syphilis, therapy failure was identified in 74% of the cases (Table 2), according to the evolution of the VDRL titration. In addition, among the 26% of inmates considered to have undergone successful treatment, 13 continued to have reactive VDRL tests, with five of those having a titer higher than eight. This result is consistent with a serofast state, re-infection, or failed treatment where individuals test positive for non-treponemal antigens even after effective treatment.<sup>5,18</sup> Of the inmates who acquired syphilis in the first year, 6% were treated with three doses of penicillin G benzathine, 4% with

two doses, and 2% were untreated. According to the prison medical records, 88% of positive cases had no treatment information. The multivariate analysis showed that not reporting a stable partner (AOR: 3.17, 95% confidence interval [CI]: 1.03–9.78) was positively associated with failure in syphilis treatment. The absence of sex with IDU (AOR: 0.097, 95% CI: 0.016–0.589) was identified as a protective factor.

Twenty-five patients were assessed for HIV-1 viral load and CD4 cell count. Of these, 13 (52%) had a viral load of > 200 copies/mL, 3 (8%) had 50–200 copies/mL, 2 (12%) had < 50 copies/mL, and the data were missing from the prison health service records for seven patients (28%). Approximately half of the inmates with viral loads > 200 copies/mL

TABLE 2  
Variables related to treatment outcomes of syphilis patients (N = 95)

Variables	Treatment successful, N = 25/95	Treatment failure, N = 70/95	P value	Crude OR (95% CI)	Adjusted OR (95% CI)
Age, years, mean $\pm$ SD	35 $\pm$ 10	40 $\pm$ 10	–	–	–
Reside in Mato Grosso do Sul	17/25 (68%)	49/70 (74%)	0.85	1.09 (0.41–2.93)	–
Illiterate	10/25 (40%)	27/68 (40%)	0.97	0.98 (0.38–2.51)	–
Gender					
Male	16/25 (64%)	53/70 (76%)	0.25	0.57 (0.21–1.52)	–
Female	09/25 (36%)	17/70 (24%)	–	–	–
Ethnicity					
White	08/24 (33.5%)	28/67 (42%)	0.78	–	–
Mixed	13/24 (54%)	32/67 (48%)	–	–	–
Black	03/24 (12.5%)	06/67 (9%)	–	–	–
Indigenous	00/24 (0.0%)	00/67 (0.0%)	–	–	–
Asian	00/24 (0.0%)	01/67 (1.0%)	–	–	–
Drug/alcohol history					
Alcohol use over the last year	15/25 (60%)	35/67 (52%)	0.50	1.37 (0.53–3.48)	–
Drug use over the last year	05/25 (5%)	23/70 (24%)	0.22	1.96 (0.65–5.88)	–
IDU over the last year	01/24 (4.0%)	01/65 (1.5%)	0.45	2.78 (1.16–46.3)	–
Ever shared needles/syringes	01/25 (4.0%)	00/70 (0.0%)	0.09	0.11 (0.00–2.93)	–
Sexual history					
Sexual preference, homosexual	03 (12%)	06 (9.0%)	0.58	0.66 (0.15–2.90)	–
Previously had homosexual intercourse	06 (24%)	08 (11%)	0.12	0.39 (0.11–1.30)	–
Sex with a drug user	13/25 (52%)	23/70 (33%)	0.09	0.45 (0.17–1.14)	–
Absence of sex with an IDU	66/89 (74%)	23/89 (26%)	0.01	0.12 (0.02–0.65)	0.097 (0.016–0.589)
Not stable partner	18/25 (28%)	35/70 (50%)	0.06	2.52 (0.96–6.61)	3.17 (1.03–9.78)
Sexual partner with human immunodeficiency virus, hepatitis, or syphilis	02/25 (8.0%)	09/69 (13%)	0.75	1.29 (0.25–6.71)	–
Condom use					
Always	11/24 (46%)	23/69 (33%)	0.27	1.69 (0.65–4.35)	–
Sometimes/never	13/24 (54%)	46/69 (66%)	–	–	–
Other risk behaviors					
History of sexually transmitted infections	06/23 (26%)	21/64 (33%)	0.55	1.38 (0.48–4.02)	–
Blood transfusion	02/25 (8%)	11/69 (16%)	0.32	2.18 (0.44–10.61)	–
Tattoos	17/25 (68%)	44/70 (63%)	0.64	0.79 (0.30–2.10)	–
Piercings	06/25 (24%)	04/69 (6%)	0.01	0.19 (0.05–0.76)	–
Mental illness	09/24 (37.5%)	16/67 (24%)	0.19	1.91 (0.70–5.19)	–
Penal institution					
EPFCAJG	01/25 (4.0%)	01/70 (1%)	0.02	–	–
EPFTL	02/25 (8.0%)	03/70 (4%)	–	–	–
EPFPP	03/25 (12%)	03/70 (4%)	–	–	–
EPFIIZ	03/25 (12%)	10/70 (14%)	–	–	–
EPC	03/25 (12%)	03/70 (4%)	–	–	–
PTL	01/25 (4.0%)	04/70 (6%)	–	–	–
EPRB	01/25 (4.0%)	03/70 (4%)	–	–	–
CTAL	01/25 (4.0%)	03/70 (4%)	–	–	–
PTCG	00/25 (0.0%)	06/70 (9%)	–	–	–
IPCG	00/25 (0.0%)	17/70 (25%)	–	–	–
EPJFC	06/25 (24%)	10/70 (14%)	–	–	–
PHAC	04/25 (16%)	07/70 (10%)	–	–	–

CTAL = Centro de Triagem Anílio Lima; CI = confidence interval; EPC = Estabelecimento Penal de Corumbá; EPFCAJG = Estabelecimento Penal Feminino Carlos Alberto Jonas Giordano; EPFIIZ = Estabelecimento Penal Feminino Irãma Irma Zorzi; EPFPP = Estabelecimento Penal Feminino de Ponta Porã; EPFTL = Estabelecimento Penal Feminino de Três Lagoas; EPJFC = Estabelecimento Penal Jair Ferreira de Carvalho; EPRB = Estabelecimento Penal Ricardo Brandão; HIV = human immunodeficiency virus; IDU = intravenous drug user; IPCG = Instituto Penal de Campo Grande; OR = odds ratio; PHAC = Penitenciária Harry Amorim Costa; PTCG = Presídio de Trânsito de Campo Grande; PTL = Penitenciária de Três Lagoas; SD = standard deviation.

(54%) regularly received medication from the pharmacy, demonstrating low adherence to treatment, or virologic failure. In addition, only 44% showed a CD4 cell count of > 350 cells/mL (Supplemental Table 1).

## DISCUSSION

The incidence of STIs is higher in inmates than in the general population; therefore, prisons require sentinel STI surveillance.<sup>9–11,21,22</sup> Although a few studies have assessed the prevalence of STIs in these environments,<sup>11,23</sup> this study, to our knowledge, is the first to describe the incidence of STIs and treatment outcomes among vulnerable populations, such as inmates. The evaluation of treatment using the VDRL test showed that only 26% of the inmates received effective treatment of syphilis. Of those, 50% still exhibited syphilis anticardiolipin antibody reagents, even with proper reduction titration. The investigation of treatment regimens showed that some inmates were treated with penicillin G benzathine. However, according to the prison medical records, only 12% of patients with positive results had adequate information about the administration of prescribed doses.

Treatment failure, reinfection, or absence of treatment was identified in 74% of the inmates, indicating that these patients could continue to spread infections, especially because most of them reported irregular condom use during sexual intercourse. Treatment outcomes failure was related to not having a stable partner. Moreover, the absence of sex with IDU was found to be a protective factor against syphilis treatment failure. This corroborates with previous studies because unsafe sexual practices with IDU was reported as a high-risk sexual behavior.<sup>9,11,14</sup> The variable absence of sex with IDU may be related to the low prevalence of injecting drug use in prisons from Mato Grosso do Sul compared with elsewhere.<sup>11</sup> Inmates had multiple sexual partners (50%) and also reported high rates of unprotected sexual intercourse (66% reported irregular condom use); therefore, more opportunities were created for the transmission of *T. pallidum* between partners, resulting in reinfection. The correctional Brazilian system is organized by gender and Brazilian inmates receive weekly intimate visits from outside of prison. Condoms are available in prison and illicit drug use is common among Brazilian inmates. Unfortunately, our study was unable to identify how the infection occurs. However, because homosexual intercourse was reported by only 7.69% of inmates, it appears that most infections do not occur inside prisons.

Failure of HIV treatment was associated with a detectable HIV-1 viral load. Antiretroviral therapy is free in Brazil; thus, the patients did not go untreated for economic reasons. Therefore, low treatment adherence and virologic failures indicate a troublesome trend, which implies an increase in mortality, the progression of AIDS, the incidence of opportunistic infections, and the number of hospitalizations.<sup>24</sup> The failure of viral suppression is also associated with increased morbidity and mortality, other comorbidities (cardiovascular disease, liver disease, and nephropathy), and increased HIV transmission to uninfected people.<sup>25</sup> The ineffective control of STIs in inmates could be attributed to the high demand for care and the low number of medical professionals in prisons. In an attempt to assuage this imbalance, Brazil upholds a specific rule that assigns a minimum multidisciplinary team of health

professionals with well-defined actions for every 500 inmates.<sup>26</sup> However, this rule is not always upheld. The high-volume workload and stress of these professionals are reflected in the quality of care in prisons, with failures in the detection, assessment, diagnosis, and treatment of inmates, leading to a poor prognosis and spread of infections.<sup>27,28</sup>

Data regarding the incidence of STIs in vulnerable populations are limited. Although a high prevalence rate of syphilis and HIV in inmates has been described,<sup>11,23</sup> a low rate of syphilis and HIV incidence (0.55%) was recognized, indicating low transmission of these infections during 1 year of imprisonment.<sup>11</sup> Although this result remains underexplored in most studies, it reinforces the importance of STI screening during prison admission, which would bring the level of early detection and treatment up to par with many developed countries.<sup>29</sup> The syphilis and HIV coinfection rate was low (0.24%), and, to our knowledge, this is the first report on the incidence of syphilis and HIV coinfection in inmates. However, syphilis infections can be an indicator of continued engagement in behaviors associated with the acquisition and transmission of HIV and other STIs. Comprehensive services for the prevention of syphilis, including counseling for risk reduction, increased access to condoms, and increased frequency of syphilis tests, can help reduce the incidence rate of syphilis and other STIs.<sup>30,31</sup>

This study has several limitations. The clinical data of patients in most of the medical records were limited. In addition, we were not able to identify cases of *T. pallidum* reinfection. Moreover, underreporting of preincarceration events is an inherent bias because it could potentially stigmatize conditions, and HIV/syphilis risk behaviors restrict the interpretation. Although all infected participants were informed of their diagnosis, we were unable to follow-up all patients for 1 year. The short period of incarceration was the primary reason for this challenge. This result highlights the importance of transitional medical care and merits further work.

In conclusion, the poor outcome of syphilis and HIV-1 treatment demonstrates the inadequacy of the public health programs, especially as they apply to vulnerable populations such as inmates. In addition, incarceration provides an opportunity to diagnose and treat HIV and other STIs in this vulnerable population that often has poor access to health services outside of prison. Thus, the results emphasize the importance of implementing health programs to enable continuous measures of prevention, treatment, and control of STIs within the prison environment.

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