HIV prevalence and risk factors in a Brazilian penitentiary

Prevalência e fatores de risco para a infecção pelo HIV em penitenciária brasileira

Harnoldo Colares Coelho [1]
Gleici Castro Perdoná [1]
Fátima Regina Neves [2]
Afonso Dinis Costa Passos [1]

[1] Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, Brasil.
[2] Programa Municipal de DST/AIDS, Secretaria Municipal de Saúde de Ribeirão Preto, Ribeirão Preto, Brasil.

Correspondence
H. C. Coelho
Departamento de Medicina Social, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo.
Av. Bandeirantes 3900, Ribeirão Preto, SP 14049-900, Brasil.
harnoldocoelho@hotmail.com

Abstract

HIV infection among prison inmates shows one of the highest prevalence rates for specific population subgroups, reaching as high as 17% in Brazil and elsewhere in the world. The present study aimed to estimate HIV antibody prevalence and risk factors for infection in male inmates at the Ribeirão Preto Penitentiary, São Paulo State, Brazil, from May to August 2003. Using simple random sampling, 333 participants were selected, answered a standardized questionnaire, and had blood samples collected. Enzyme-linked immunosorbent assay (ELISA) and indirect immunofluorescence were used for HIV serological diagnosis. Overall HIV prevalence among inmates was 5.7% (95%CI: 3.2-8.2). All variables associated with HIV antibodies in the univariate analysis were submitted to unconditional multivariate logistic regression. Independent predictors of HIV infection were: total prison sentence less than five years and sharing needles and syringes.

HIV; Prisons; Prevalence; Risk Factors

Introduction

The first autochthonous case of AIDS in Brazil was a 41-year-old male homosexual diagnosed in late 1982 [1]. By June 2004, the National STD/AIDS Program had received reports of 362,364 cases including adults and children [2].

In the Ribeirão Preto region, the epidemic initially appeared in hemophiliacs and male homosexuals and spread among injecting drug users (IDU) in the 1980s. In the city of Ribeirão Preto, as in the State of São Paulo and Brazil as a whole, heterosexual transmission has increased since 1993.

Because of the HIV transmission mechanisms, some population groups have proven more susceptible to infection. Thus, specific measures have been taken to prevent HIV infection among various groups like sex workers, IDU, male homosexuals, truck drivers, street children, and prison inmates. This last group is considered to be at high risk, since prisons frequently present favorable conditions for the spread of HIV, e.g. overcrowding, promiscuity, unprotected sex in homosexual relations, sharing paraphernalia for illicit IV drug use, tattooing under unsafe conditions, etc. As early as August 1982, opportunistic infections were reported among New York State prison inmates [3]. From January 1994 to December 1996, 220 thousand AIDS cases were reported in the United States, 9,370 of whom (4%) were in prison at the time of diagnosis [4]. Varying preva-

lence rates have been reported for prison inmates in different countries, ranging from 1.2% in Mexico [5] to 6% in France [6] and 24.6% in Spain [7].

According to the Brazilian Ministry of Justice, the country's total prison population was 331,457 in June 2004 [8], with the largest contingent in the State of São Paulo, totaling 131,240 inmates in December that year [9]. Despite this large population, few studies on prison inmates have been done in Brazil, but they show wide variations in HIV prevalence. To address this relevant issue and the lack of data on HIV/AIDS in Brazilian prison inmates, a serological survey was conducted in male inmates at the Ribeirão Preto Penitentiary.

Material and methods

The Ribeirão Preto Penitentiary consists of four pavilions with closed confinement and one with semi-open confinement, with approximately 1,030 inmates in May 2003. The reference population consisted of all 893 inmates in closed confinement. Inmates in semi-open confinement were excluded due to their high turnover and the fact that they were housed in an area with difficult access to the facility where the study procedures were conducted. The sample size was calculated by assuming a 15% HIV seroprevalence rate among the prison inmates, 4% precision, and 95% confidence interval (95%CI), leading to a minimum of 306 participants.

A simple random sampling process was used, with 100 inmates selected by drawing lots in each of the four closed-confinement pavilions. All selected inmates that agreed to participate and signed a free consent form after being informed about the study's objectives and methodology were included.

Participants were informed in an accessible language about sexually transmissible diseases (STD) and AIDS, including the main transmission routes and evolution of the disease, risks associated with different sexual practices, and the importance of serological diagnosis. Participants answered a questionnaire with demographic data, time served in prison, and risk factors for HIV infection. All the questionnaires were applied by the same investigator, an infectologist with extensive experience in HIV/AIDS care. Absolute confidentiality was guaranteed regarding all the information collected and the test results, as stated on the consent form.

A disposable needle and 5ml Vacutainer tube were used for blood collection. Each tube was identified with the inmate's initials and questionnaire number. Samples were centrifuged at 3,000 rpm for 10 minutes, and two serum aliquots were separated and stored in a freezer at -20ºC in Eppendorf tubes. Serological tests were performed in the STD Reference Serology Laboratory, Ribeirão Preto Municipal Health Department. All samples were submitted to ELISA (Enzygnost® Anti-HIV 1/2 Plus, Dade Behring, Illinois, USA) by a manual technique using an EL_X 800® reader (Bio-Tek Instruments Inc., Vermont, USA). Positive samples were submitted to a second ELISA and IFF. A new blood sample was collected from all positive individuals for a confirmatory test using an additional ELISA (Enzygnost® Anti-HIV 1/2 Plus). Completion of the questionnaire and drawing of blood samples took place from May to August 2003.

Data were keyed into Epi Info 6.04 (Centers for Disease Control and Prevention, Atlanta, USA) and then transported to Stata 6.0 (Stata Corp., College Station, USA). The initial association analyses used the chi-square and Fisher exact tests. Variables with $p \leq 0.25$ in univariate analysis were selected for multivariate analysis by an unconditional logistic regression model. The project was approved by the Research Ethics Committee of the University Hospital, Ribeirão Preto School of Medicine, University of São Paulo.

Results

Of the 345 inmates who answered the questionnaire and signed a free informed consent form, 333 provided a blood sample and effectively participated in the study. Twelve inmates refused to submit to blood samples. Age ranged from 19 to 69 years (mean 30.1; median 28). More than half (52.9%) had been born in the city of Ribeirão Preto and vicinity, while 24.6% had been born in other regions of the State of São Paulo and 22.5% in other States. 58% of participants reported having a steady sexual partner.

Some 81% of subjects reported using at least one type of non-injecting illicit drug prior to imprisonment. The age bracket with the highest consumption was 19-30 years ($p = 0.001$), with marihuana as the most frequently used drug. Only 8.7% of participants reported prior use of an illicit injecting drug, with a predominance of the over-31 age group ($p = 0.008$). HIV serology was positive in 19 inmates, corresponding to a prevalence rate of 5.7% (95%CI: 3.2-8.2). Most subjects (194/333) reported a prior HIV test, and nearly one-third reported more than one test (105/333). However, more than 40% of participants reported never having been tested for HIV.

As shown in Table 1, the distribution of HIV+ inmates was higher in the age groups over 30, varying from 3.7% in the 25-30 year group to 9.1%

Table 1

HIV prevalence according to age, schooling, total prison sentence, and history of blood transfusion, hepatitis, and jaundice.

Variable	n	HIV+ (%)	p
Age (years)			
19-24	96	4 (4.2)	0.082
25-30	107	4 (3.7)	
31-35	55	5 (9.1)	
36-45	60	5 (8.3)	
> 45	15	1 (6.7)	
Schooling (years)			
< 2	51	4 (7.8)	0.145
2-4	147	8 (5.4)	
5-8	95	7 (7.4)	
> 8	40	-	
Total prison sentence (years)			
≤ 5	93	11 (11.8)	0.003
> 5	240	8 (3.3)	
History of blood transfusion			
Yes	32	4 (12.5)	0.097
No	301	15 (5.0)	
Previous hepatitis			
Yes	27	4 (14.8)	0.057
No	306	15 (4.9)	
Previous jaundice			
Yes	24	4 (16.7)	0.039
No	309	15 (4.9)	

in those 31 to 35 years of age (by grouping participants into two age ranges: ≤ 30 years and > 30: p = 0.082). HIV was inversely proportional to schooling and was absent in inmates with more than 8 years of schooling and highest (7.8%) among those with less than 2 years (by grouping the categories into ≤ 5 years and > 5 years of schooling: p = 0.145). HIV rate was inversely proportional to the total prison sentence: 11.8% in inmates sentenced to ≤ 5 years and 3.3% in those sentenced to > 5 years (p = 0.003). History of blood transfusion was associated with higher HIV prevalence (12.5% versus 5%; p = 0.097). Inmates with a history of hepatitis showed a higher HIV rate (14.8% versus 4.9%), as did those who reported a history of jaundice (16.7% versus 4.9%). These differences showed p values of 0.057 and 0.039, respectively.

Table 2 shows the distribution of participants and HIV positivity according to various sexual and injecting drug-use variables. Interestingly, one participant reported homosexual preference (0.3%). He was HIV-positive, and although he was the only self-declared homosexual, his positive status produced a value quite close to statistical significance in the univariate analysis (p = 0.057). There was no association between HIV and reported number of sex partners during the year preceding incarceration (p = 0.188), although the prevalence values were discrepant (14.3% for those with ≥ 10 partners and 5.4% < 10 partners). There was a predominance of non-ulcerative as compared to ulcerative STDs (30.6% and 7.2%, respectively), with only the former showing a statistically significant association with HIV infection (p = 0.032). A high percentage of participants (152/333, or 45.6%) reported a history of sexual relations with illicit drug-using partners, showing a significantly higher HIV rate (8.5%) than the 3.3% observed among those reporting no such history (p = 0.040). We emphasize the strong statistical association between HIV+ status and drug injecting (p = 0.000) and needle sharing (p = 0.000), despite the low frequency of these practices in the study population.

Table 3 shows the results of the multivariate analysis. In the final model, two variables (sharing needles/syringes and total sentence) were independently predictive of HIV infection.

Table 2

HIV prevalence according to sexual and drug-use factors.

Variable	n	HIV+ (%)	p
Sexual preference			
Heterosexual	332	18 (5.4)	0.057
Homosexual	1	1 (100.0)	
Number of sexual partners in previous year			
≤ 10	317	17 (5.4)	0.188
> 10	14	2 (14.3)	
Previous ulcerative STD			
Yes	24	2 (8.3)	0.637
No	309	17 (5.5)	
Previous non-ulcerative STD			
Yes	102	10 (9.8)	0.032
No	231	9 (3.9)	
Sex with illicit drug user			
Yes	152	13 (8.5)	0.040
No	181	6 (3.3)	
Previous injecting drug use			
Yes	29	10 (34.5)	0.000
No	304	9 (3.0)	
Previous sharing of needles/syringes			
Yes	11	7 (63.6)	0.000
No	322	12 (3.7)	

Table 3

Results of logistic regression model for variables associated with HIV infection.

Variable	OR	95%CI	p
Age	1.02	0.94-1.09	0.641
Previous non-ulcerative STD	1.37	0.40-4.66	0.617
Previous jaundice	1.63	0.22-11.7	0.627
Previous hepatitis	0.75	0.10-5.41	0.776
History of blood transfusion	1.38	0.26-7.15	0.697
Previous HIV test	1.77	0.46-6.74	0.403
Sex with illicit drug user	1.41	0.41-4.79	0.577
Previous injecting drug use	4.47	0.91-21.87	0.065
Previous sharing of needles/syringes	7.63	1.12-51.82	0.038
Number of sexual partners in previous year	2.21	0.32-15.23	0.420
Total prison sentence	4.48	1.38-14.41	0.012

Discussion

Since the initial research on AIDS in the mid-1980s, HIV prevalence in prisons has always been markedly higher than in the general population. In the present study, we detected a rate almost seven-fold that estimated for the Brazilian male population in general (0.84%) [10]. However, the 5.7% HIV+ rate in the present study is much lower than in most Brazilian studies, although wide variation is observed among different prison units. Thus, in 1987, no HIV+ individual was detected among the 57 inmates tested in the Sorocaba Public Jail, São Paulo State [11]. Inversely,

one of the first studies in the Carandiru Prison Complex in São Paulo State in 1988 showed a 12.5% prevalence rate [12]. In 1990, the House of Detention in the Carandiru Complex showed a 17.3% rate [13]. In the same year, a study on 1,692 inmates tested at incarceration in the same complex showed a 16.5% rate [14]. The Londrina Public Jail in Paraná State in 1991 had a rate of 6.3% [15], close to the 7.5% detected in jails in the cities of Mogi das Cruzes and Suzano, São Paulo State, in 1993 [16]. Two surveys conducted in parallel at the House of Detention in the Carandiru Complex in 1993 and 1994 showed prevalence rates of 13.7% and 16%, respectively [17,18]. In 1996 the following prevalence rates were detected in Brazilian prisons: 3.2% in Manhuaçu, Minas Gerais [19], 14.4% in Campinas, São Paulo [20], 12.6% in two prisons in Sorocaba [21], 1.6% in Fortaleza, Ceará [22], and 4.9% in Rio de Janeiro [23]. Two studies were done at correctional facilities for adolescents: one at the São Paulo State Foundation for the Well-Being of Minors (FEBEM) in 1994, showed a prevalence rate of 3.2% [24], and the other, in the State of Espírito Santo, in 1999, showed a 4.8% rate [25]. Analysis of these data shows that the prevalence rates were markedly higher in prisons in the State of São Paulo. It should be pointed out, however, that all of these studies were done at least nine years ago, possibly not expressing current reality. High numbers, especially in the Carandiru Complex, reflect that particular time, with a growing epidemic due to unsafe behaviors and the total absence of a policy for the fight against the spread of HIV.

In the United States, numerous studies have been done since identification of the first prison inmates with AIDS [26]. One of the main prevalence studies was by Vlahov et al. [27] in 1991, reporting a 4.3% HIV+ serology rate in 10,994 men and women upon entering prison in 1988 and 1989. Prevalence rates also show wide variation in other parts of the world. In 1987, Harding [28] surveyed data from 16 European countries and detected widely different rates, i.e., 0.1% in England, 1.3% in Belgium; 2.1% in Luxembourg, 11% in Switzerland, 12.6% in France, 16.8% in Italy, and 26% in Spain.

The higher prevalence in the 31-35-year age group is consistent with the results observed in the Brazilian male population as a whole, in which the largest proportion of cases is reported in this age bracket (23%) [2]. The result is consistent with rates detected in Campinas [20] and Sorocaba [21] and with the general epidemiology for American prison inmates [4]. In one of several studies in the Carandiru prison complex, Lourenço [14], in 1996, observed a higher prevalence (23%) among individuals 21-25 years of age. In contrast, in prisons in Southeast France [29] the highest HIV prevalence was in the 26-30-year group.

Nearly 60% of inmates in the present study had fewer than 6 years of schooling, reflecting difficult access to school, or more probably, early dropout. Although this difference did not reach statistical significance, there was a higher concentration of HIV+ inmates with low schooling, consistent with other studies in prison populations [8,21]. Importantly, however, the progressively higher proportion of HIV+ individuals with lower socioeconomic status has been observed in the Brazilian population as a whole in recent years.

In contrast to observations in the Carandiru Complex [14], there was no statistically significant difference in HIV prevalence in relation to the portion of the sentence already served. However, in the final multivariate model there was an inverse association between HIV infection and total length of sentence, with a higher prevalence among inmates with sentences of 5 years or less. One might assume intuitively that the risk of infection would be associated with longer time spent in prison, rather than the opposite. A possible explanation for this finding may be the fact that serious crimes (homicide, drug traffic) that involve long prison terms may not be necessarily associated with HIV risk behavior. In contrast, less serious crimes (possession of illicit drugs or weapons, petty theft) are often motivated by the need to support a drug habit. This situation, in turn, may be linked to other risk behaviors such as multiple partners and unprotected sex.

The disagreement between the present study and the literature in relation to lack of statistical association between ulcerative STDs and positive HIV serology may be due to the rarity of these diseases in the study population, reported by only 7.2% of the participants. Meanwhile, the frequent history of non-ulcerative STDs (30.6%), higher than in the Carandiru prison (23.7%) in 1992 [14] and mainly at FEBEM (12%) [24], deserves attention. However, this variable was not associated with HIV infection in the multivariate analysis.

Several reports mention homosexual contact among prison inmates [5,14,17,21]. The present study did not confirm this finding, a fact possibly explained by the stigma associated with this issue, leading inmates to deny this practice. Sexual preference in this setting may also be circumstantial. An individual may be *currently* rather than *definitively* involved in homosexual contact for a number of reasons, the most predominant of which is coercion. The only inmate who admitted his homosexuality was already aware of his HIV+ status and commented that his homo-

sexual practice had been the cause of his infection. A similar finding was described by Power et al. [30], who reported only one participant involved in homosexual relations in a group of 559 inmates in Scotland. However, papers reporting homosexual inmates who practice sex inside the prison are more numerous. In the present investigation, even with a p-value of less than 0.25 in the univariate analysis, this variable could not be included in the logistic regression model because it presented a value of zero in one of the boxes in the 2x2 table. An identical fact occurred with the schooling variable when it was analyzed in two strata. The statistical analysis was thus complemented with a Bayesian logistic regression model [31], which did not show an association between HIV infection and variables such as sexual preference and schooling (at the 5% significance level).

As reported for prisons in France [29], multiple sex partners were not found to be a risk factor for HIV infection, with 89.5% of HIV+ inmates reporting fewer than 10 partners in the year preceding imprisonment.

Multivariate analysis did not demonstrate statistical association between HIV infection and sexual relations with illicit drug users, although 68.4% of participants with positive serology reported a history of this behavior. It is interesting to note the percentage of sexual relations with drug users (45.6%), which may have been even higher due to the possibility that participants did not perceive the use of such substances by casual partners.

Previous consumption of illicit non-injecting drugs mainly involved three substances, marihuana, cocaine, and crack, separately or in combination. Rate of use of these drugs was extremely high (81.4%), with a marked predominance in individuals ≤ 30 years of age, despite considerable use by older individuals as well. This value is similar to the 90% rate detected at two juvenile correctional facilities in São Paulo [24].

Among inmates taking any kinds of drugs, marihuana only was used by 39.8% of the sample, increasing to 46.5% when considered in combination with other drugs. This figure is comparable to the 50.5% observed at correctional facilities for adolescents in Espírito Santo [25] and lower than the 84% reported at FEBEM in São Paulo [24].

In contrast to the widespread use of non-injecting illicit drugs, the use of injecting drugs prior to incarceration was reported by only 8.7% of inmates, predominantly by individuals older than 30. Interestingly, Lourenço [14], in 1990, observed that most (79%) of incarcerated IDU were under 30. These individuals are now older, suggesting that drug consumption was a common habit in the past but much less frequent among today's youth. Importantly, this consumption was strongly associated with sharing needles and syringes, a practice now targeted by constant campaigns to reduce the risk of blood-transmitted diseases.

The investigation of the use of injecting drugs was based on their use at some time in life, in the past and/or present. The fact that no participant reported current drug injecting raises some questions regarding the possibility of response bias. Denial of injecting drug use inside prison may be due primarily to the stigma associated with this behavior – disapproved by common sense and criminally punished – as well as the fear of retaliation if such illegal conduct is revealed.

HIV infection was more than 10.5 times higher among inmates who admitted previous drug injecting (34.5% versus 3.3%) and 17.2 times higher among those who admitted sharing needles and syringes (63.6% versus 3.7%), showing strong statistical association in multivariate analysis. The variable "syringe/needle sharing" remained associated with HIV infection in the multivariate model, while "injecting drug use" showed borderline statistical significance. This supports the role of these exposures as independent predictors of HIV infection, with emphasis on the major risk posed by sharing syringes and needles. The small number of participants who reported prior drug injecting and sharing of syringes/needles explains the large variation observed in their confidence intervals.

Since the onset of the AIDS epidemic, incarcerated persons have been a source of great concern for control programs, since they are exposed to behavioral and environmental risks involving a high probability of infection. Brazilian prisons clearly represent a synthesis of this situation. Different HIV prevalence rates among prison inmates were observed in the late 1980s, but to date there has been no account of the reality in the country's prison population as a whole.

However, the few available data indicate that AIDS in the penal system is associated with low socioeconomic status, low schooling, conflicts with the family and community of origin, and frequent risk practices represented by drug use and multiple unprotected sexual relations. Unfavorable institutional conditions for the development of educational programs further aggravate these underlying social determinants.

The lower HIV prevalence as compared to previous studies may be due to different factors such as general stabilization of the disease in the country, accompanied by behavioral changes among IDU, who no longer share needles and syringes, and the replacement of injecting drugs

with inhalants or others. This lower prevalence may also be due to increased perception of the risk of HIV infection through different transmission routes. Finally, even though their reach is still limited, one should not forget the role of prevention programs inside penitentiaries.

Most prison inmates are aware of the HIV transmission mechanisms, especially the sexual route. However, implementation of preventive measures is still minimal, indicating the need to develop and maintain aggressive activities aimed at on-going education and counseling. Counseling doubtlessly has an enormous potential to produce a positive impact on the fight against the AIDS epidemic, since it establishes a relationship of trust vis-à-vis transmission of informative content, more easily absorbed and incorporated by inmates. The observation that more than 40% of participants in this study had never tested for HIV reinforces the need to introduce counseling, which could be implemented on a group basis, thus allowing the exchange of experiences and information that could greatly enrich the process.

Finally, there is a clear need for on-going epidemiological studies to provide updated information on inmates' health status. The marked marginalization of this population group is reflected in its low priority among researchers and by health services. Thus, ignorance of health conditions in prisons poses a serious obstacle to the definition and implementation of high-impact health interventions.

Resumo

A infecção pelo HIV em presidiários alcança uma das maiores prevalências entre subgrupos populacionais específicos, com taxas de até 17%, já tendo sido descritas no Brasil e no mundo. Esta pesquisa objetivou estimar a prevalência do marcador do HIV e fatores de risco para essa infecção na população masculina carcerária da Penitenciária de Ribeirão Preto, São Paulo, Brasil, no período de maio a agosto de 2003. Do total de 1.030 presidiários, foram sorteados 333 participantes por amostragem aleatória simples, os quais foram submetidos à aplicação de um questionário padronizado e coleta de sangue. Para diagnóstico sorológico do HIV foi utilizado o ensaio imunoenzimático (ELISA) e reação de imunofluorescência indireta. A prevalência global do HIV nos presidiários foi de 5,7% (IC95%: 3,2-8,2). Todas as variáveis que mostraram associação com presença do anti-HIV, por meio de análise univariada, foram submetidas a modelo multivariado de regressão logística não condicional. As variáveis que se mostraram preditoras de forma independente da infecção pelo HIV foram: tempo total da pena a ser cumprida inferior a cinco anos e compartilhamento de agulhas e seringas.

HIV; Prisões; Prevalência; Fatores de Risco

Contributors

H. C. Coelho participated in the study design, data collection and analysis, drafting of the article, literature review, and revision of the manuscript. A. D. C. Passos collaborated in the definition of the methodology, data analysis, discussion of the results, and review of the manuscript. G. C. Perdoná contributed to the discussion of the methodology and helped with the statistical analysis. F. R. Neves organized the laboratory tests and helped perform them.

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