

Syphilis, human immunodeficiency virus, herpes genital and hepatitis B in a women's prison in Cochabamba, Bolivia: prevalence and risk factors

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ABSTRACT

Objective: To determine the prevalence and factors associated with syphilis, human immunodeficiency virus (HIV), hepatitis B (HBV) and herpes type 2 (HSV2) among women in the prison of San Sebastian in Cochabamba (Bolivia).

Material and methods: We carried out a cross-sectional study including a standardized questionnaire to assess socio-demographics characteristics and risk factors (sexual practices and exposure to blood); and serological tests for syphilis, HSV2, VIH, and HBV. We performed bivariate and multivariate analyses to test the associations between variables of interest and infections.

Results: A total of 219 out of 220 prisoners (99.5%) participated in the study. For syphilis, 12.8% of participants had both reactive tests (RPR+/TPPA+). The prevalence of HSV2 and VIH was 62.6% and 1.4%, respectively. Anti-HBc, indicating a resolved or chronic HBV, was positive in 11.9% of participants and 0.5% had active HBV (HBsAg positive). A low level of education was associated with syphilis, HSV2 and HBV. Having occasional sexual partners was associated with syphilis and HSV2. Being over 36 years old and having more than 3 children were associated with HBV. The number of sexual partners, history of prostitution and rape, having sexual intercourses in prison and detention time were not associated with any of these infections.

Discussion: The prevalence of syphilis, HIV, HSV2 and HBV was higher in this vulnerable female population than in the general population in Bolivia. Control measures in detention are needed to limit the spread of these infections both in prisons and in the community.

Keywords: prisons; syphilis; HIV antibodies; hepatitis B; herpes genitalis; prevalence; risk factors; cross-sectional studies.

INTRODUCTION

Access to healthcare in prison is an increasing public health concern that should be included in the public health agenda. All over the world, the prevalence of sexually transmitted infections (STIs) and blood-borne infections is higher among the imprisoned population than in the general population^{1,2}. Communicable diseases can not only be spread within prisons but also outside. Indeed, visitors and correctional staff are in contact with people deprived from their liberty and may be infected by these communicable diseases. Moreover, inmates who are not treated in prison can spread their disease after release. Women deprived from their liberty (WDL) can disproportionately contribute to the heterosexual and perinatal transmission of STI. Therefore, they constitute a key population for the implementation of preventive programs³. Indeed, WDL frequently present a higher prevalence of STI than imprisoned males³. Moreover, previous studies reported an increase in risky sexual behaviours in prison setting, this risk being higher in women than in men^{2,4}.

The high prevalence of these infections can be influenced by factors that precede imprisonment. These factors include low socioeconomic status, high-risk sexual behaviours, limited access to health care and injecting drug use. During imprisonment, inmates face other important risk factors: overcrowding, sharing contaminated objects or risky sexual intercourses. All these factors can contribute to the infection^{5,6}.

Human immunodeficiency virus (HIV), hepatitis B virus (HBV) and syphilis are diseases that can remain asymptomatic for years before causing severe complications. The infection by herpes virus type 2 (HSV2) has received a special attention in recent years because it can increase the risk of HIV infection by up to three times and because it accelerates its progression⁷.

Data on the prevalence and risk factors for HIV, HBV, syphilis and HSV2 among the imprisoned population in Latin American are scarce. The review showed that no previous studies assessed the epidemiology of these diseases in correctional facilities in Bolivia. We believe that information on the prevalence of these diseases and their corresponding risk factors in prisons is of crucial importance, in particular in countries with limited resources to prioritize and to plan specific preventive measures and efficient health interventions. The objective of our study was to assess the prevalence and risk fac-

tors associated to HIV, HBV, syphilis and HSV2 in a prison in Cochabamba (Bolivia).

MATERIAL AND METHODS

An observational cross-sectional study was carried out between September and October 2013.

Study Population

The study was carried out in the prison of San Sebastian, located in Cochabamba. This prison hosts women over 16 years old. During the study period, the prison hosted 220 WDL. Relatives and friends can visit inmates and sexual intercourses are allowed, since the prison has a room for conjugal visits.

Ethical considerations

This project was approved by the Bioethics Committee of University *Mayor de San Simón*, Cochabamba, Bolivia (on 21/12/2012). During the study period, all WDL were invited to participate. Each of them received an information sheet and signed an informed consent form. Refusal to participate did not entail any form of penalty.

Data collection

During the interview with participants, the investigator completed a questionnaire on socio-demographic variables, clinical data, sexual practices and exposure to blood. Questions related to the knowledge of how diseases are transmitted and on the protection modes against HIV and HBV were also included, as validated by a previous study carried out in a correctional setting⁸.

Laboratory analysis

Five ml blood samples were collected for each participant. After centrifugation of the samples, the serum was conserved at -20°C until the processing of analysis in the laboratory Labimed of University *Mayor de San Simón*, Cochabamba, Bolivia (a reference centre for the diagnosis of STI). For HIV, we used a rapid test detecting specific antibodies and Agp24 (Alere Determine™ HIV-1/2). When positive, a confirmation ELISA test (*Enzyme-Linked ImmunoSorbent Assay*) (bioMérieux) was performed. For HBV, an ELISA test detecting anti-HBc antibodies was performed (bioMérieux), corresponding to resolved or chronic infections. When positive, it was completed with the detection of HBsAg antigens with

an ELISA test (bioMérieux SA) to identify patients with chronic HBV. For syphilis, we used a nontreponemal test (RPR, *Rapid Plasma Reagin* test, BioMérieux) and a treponemal test (TPPA, *Treponema pallidum particle agglutination*) (Serodia Fujirebio). RPR results were determined using serial dilutions. We considered that syphilis was active for all women with positive results for both the RPR and TPPA tests⁹. Specific antibodies for HSV2 were determined using an ELISA test (ImmunoWell, GenBio). All serological samples were processed according to the standards of producers.

Care provided to patients with positive serological tests

All participants with positive results received a full explanation of their health issue. Participants infected by syphilis (TPPA+ and RPR+) received intramuscular penicillin G (benzathine) (one every week, three times). Patients infected by HIV were referred to the HIV department which granted free access to antiretroviral combination therapy.

Statistical analysis

STATA (version 13 for Windows) was used to analyse data. Descriptive statistics included percentages (qualitative variables) and means/standard deviations (quantitative variables). Associations between variables of interest and positive serologies for the three diseases (syphilis, HSV2 and HVB) were tested using a simple logistic regression model (bivariate analysis). Odds ratio (OR) and 95% confidence intervals were computed. The independent associations were then assessed by calculating adjusted OR using a multiple logistic regression model. This model included all statistically significant variables ($p < 0.2$ in the bivariate analysis). In the tables of bivariate and multivariate analyses the associations between HIV, chronic HBV and the variables of interest were not included, due to the small percentage of infected participants.

RESULTS

In the study period, 220 women were hosted in the prison, of whom 219 accepted to participate (99.5%).

Features of participants

Table 1 depicts participants' sociodemographic characteristics. The mean age was 35.9 years. The

Table 1. Sociodemographic features of population under study.

Variables	n (%)
Age	
<36 years	118 (53.9%)
≥36 years	101 (46.1%)
Level of education	
Illiteracy-Primary	95 (43.4%)
Secondary-University	124 (56.6%)
Marital Status	
Single	80 (36.5%)
Married	51 (23.3%)
Common-law partner	57 (26.0%)
Divorced	17 (7.8%)
Widowed	14 (6.4%)
Number of children	
0	29 (13.2%)
1-3	124 (56.6%)
4-15	66 (30.1%)
Duration of imprisonment	
<12 months	99 (45.2%)
≥12 months	120 (54.8%)

mean number of children was three per WDL and only 13.2% had no offspring.

All participants reported having had during their life at least one sexual partner, and approximately one third (31.5%) had sexual intercourses during their detention. A total of 6.8% reported a history of prostitution and 4.6% did not answer this question. Out of the 62 WDL who occasionally had sexual intercourses in the prison, 93.5% reported irregular use of condoms. The three main reasons were: trusting the partner(s) (55.2%), partners' refusal (19%) and having no condom (15.5%). Two participants were afraid to ask their partners and did not know how to use condoms. Regarding sexual violence, 15.1% of WDL reported having been raped and 5.0% did not answer this question. For the background of exposure to blood, blood transfusions (16.9%) and tattoos (27.0%) were most commonly mentioned. A total of 2.3% of WDL reported getting a tattoo in prison. Only 8.2% of the participants declared having been vaccinated against HBV.

Table 2. Prevalence of sexually transmitted diseases in the population under study.

Diseases	N = 219	%	(95% CI)
Syphilis (TPPA+ and RPR+)	28	12.8%	(8.8-17.7)
HIV(Determine+ and ELISA+)	3	1.4%	(0.3-3.7)
Chronic Hepatitis B (HbsAg+)	1	0.5%	(0.02-2.2)
HSV2 (specific ELISA +)	137	62.6%	(56.0-68.8)

Note. 95% CI: 95% confidence interval.

Prevalence of syphilis, HIV, HSV2 and HBV (Table 2)

For syphilis, 12.8% of participants were RPR and TPPA positive. The seroprevalences of HSV2 and HIV were 62.6% and 1.4%. The anti-HBc test indicating resolved or chronic HBV was positive in 11.9% of the cases and 0.5% had chronic HBV (HBsAg+).

Factors associated to HBV, syphilis and HSV2

Syphilis and HSV2 were significantly associated to a low level of formal education and with occasional partners (association between HSV2 and level of education marginally significant). HBV was associated to a low level of education, being over 36 years old and having over three children (Tables 3 and 4). None of the infections were significantly associated with the marital status, the duration of imprisonment, the number of sexual partners or a history of injected drug use, tattoos, piercing, rape or prostitution. Syphilis and HSV2 were not associated to age.

Coinfection

There was a statistically significant association between syphilis and HBV: among women infected by syphilis, 28.6% (8/28) had positive anti-HBc while in the absence of syphilis, only 9.4% (18/191) had positive anti-HBc ($p=0.003$). There was also a statistically significant association between syphilis and HSV2: out of the WDL infected by syphilis, 82% (23/28) had positive HSV2 markers, while in the absence of syphilis, only 59.7% (114/191) were HSV2 positive ($p=0.02$).

Knowledge of the modes of transmission and protection against HIV and HBV

Only 14.6% and 20.5% of WDL reported knowing that HBV can also be spread during unprotected sexual intercourse or by getting a tattoo. Regarding perinatal transmission, 23.3% and 71.2% of participants knew that HBV and HIV can be transmitted from an infected mother to their child during birth, which is a statistically significant difference ($p<0.001$). A total of 72.1% and 19.2% of WDL, knew

Table 3. Syphilis and herpes type 2: prevalence, odds ratio (crude and adjusted), according to sociodemographic and exposure factors.

Variables*	Syphilis			Herpes type 2		
	n (%)	OR (95% CI)	aOR (95% CI)	n (%)	OR (95% CI)	aOR (95% CI)
Level of education						
Illiteracy-Primary	20/95 (21%)	3.84 (1.63- 9.69)	4.22 (2.01- 10.07)	67/95 (70.5%)	1.84 (1.05- 3.27)	1.73 (0.98-3.07)
Secondary-Higher	8/124 (8,5%)	1 ref.	1 ref.	70/124 (56,4%)	1 ref.	1 ref.
Occasional Partners						
Yes	20/112 (17.9%)	3.04 (1.21- 7.65)	3.28 (1.27- 8.45)	78/112 (69.6%)	1.93 (1.09-3.39)	1.88 (1.07- 3.31)
No	7/105 (6.7%)	1 ref.	1 ref.	57/105 (54.3%)	1 ref.	1 ref.

Note. 95% CI: 95% confidence Interval. OR: odds ratio; aOR: adjusted for both variables in the table.

*No relevant association ($p > 0.2$ in bivariate analysis) with age, civil status, duration of imprisonment, number of sexual partners, background of piercing, rape or prostitution.

Table 4. Hepatitis B (resolved or chronic): prevalence, odds ratio (crude and adjusted) according to sociodemographic factors.

Variables*	n (%)	Hepatitis B (anti-HBc+)	
		OR (95% CI)	aOR (95% CI)
Level of education			
Illiteracy-Primary	17/95 (17.9%)	2.77 (1.18-6.82)	3.5 (1.54- 3.68)
Secondary-Higher	8/92 (8.7%)	1 ref.	1 ref.
Age			
<36 years	7/118 (5.9%)	1 ref.	1 ref.
≥36 years	19/101 (18.8%)	3.67 (1.44- 9.34)	2.98 (1.25 – 8.63)
Number of children			
0-2	10/114 (0.7%)	1 ref.	1 ref.
3-4	7/64 (10.9%)	1.3 (.46-3.5)	3.69 (1.26 – 8.89)
5-15	9/41 (22.0%)	2.9 (1.1-7.8)	4.87 (2.36 – 9.47)

Note. 95% CI: 95% confidence Interval. OR: odds ratio; aOR: adjusted for both variables in the table.

*No relevant association ($p > 0.2$ in bivariate analysis) with age, civil status, duration of imprisonment, number of sexual partners, background of piercing, rape or prostitution.

that HIV and HBV are not spread by shaking hands with an infected patient ($p < 0.001$). Moreover, 63.5% and 9.6% of WDL knew that HIV and HBV are not transmitted by sharing food with infected patients ($p < 0.001$). A total of 71% of participants reported having not enough information on STIs.

DISCUSSION

This was the first study assessing the epidemiology of sexually transmitted infections (STI) in an imprisoned population in Bolivia and to shed light on this major public health issue.

HIV

The prevalence of HIV is significantly higher among the imprisoned population, including in low and middle-income countries². This study confirmed that the prevalence of HIV (1.4%) among WDL in Cochabamba was higher than in the general population. In Bolivia, the overall estimated prevalence of HIV is 0.15% and under 0.2% among pregnant women¹⁰.

Syphilis

The prevalence of syphilis in the study population (12.8%) was three times higher than that of the general population in Bolivia, as observed in a study carried out in pregnant women in Cochabamba, with an estimated rate of 4.3%¹¹. In Brazil (prevalence

rates of 5.7% to 17.0% among WDL)^{3,12,13}, as well as in Bolivia, the prevalence was almost three times higher than among the general population¹⁴. In contrast, among females in prison in Mexico, the prevalence was lower (3.3%)².

Approximately 15% of people infected who remain untreated develop tertiary syphilis with severe neurological, cardiological and articular manifestations¹⁵.

Moreover, this disease can facilitate the transmission of HIV¹⁶.

HSV2

HSV2 is a specific marker of sexual transmission. It causes multiple and painful genital ulcers, sometimes with fever and meningitis. Infected patients can suffer from frequent relapses. Furthermore, this disease is associated to an increased risk of transmission of other STI, of up to three times, including HIV, as proved among imprisoned populations in the United States¹⁷.

In Bolivia, the infection by HSV2 is a neglected and poorly monitored disease. In our study sample the seroprevalence was 62.6% higher than those reported by other countries in the Americas, where the average prevalence of HSV2 in women is 18%⁷. National records in some countries in Latin America show prevalence rates ranging from 5% to 50% among women¹⁸. But there is a lack of published data for HSV2 in prisons. In countries like Australia and Italy, the prevalence rates are 58% and 13%^{5,19}.

HBV

Bolivia is a country of low endemicity for HBV. In previous epidemiological studies on HBV in Bolivia, a prevalence of chronic HBV of 0.3% was found among blood donors, slightly lower than among our study population (0.5%)²⁰. In comparison, prevalence rates of chronic HBV were 0.3% and 7.4% in female prisons in Mexico and Brazil^{2,3}.

Recommendations

Control measures in prisons are needed to mitigate these infections and to control their spread. The high rate of acceptance for STI screening, with no need of incentives or punishments, suggests that this population believes in the advantages of treatment and prevention programs. Beltrami et al.²¹ showed that access to screening and treatment programs in prison can also lead to a reduction of STI in the community.

Based on our study's findings, we propose to use systematic screenings for the most common and severe STI (syphilis and HIV) among WDL in Cochabamba. Women with identified risk factors (e.g., a low level of formal education and occasional intercoursés with multiple partners) should be at focus. From an epidemiological point of view, even if there was a low seroprevalence of HBV (0.5%) in the prison of San Sebastian, it could be useful to implement vaccination against HBV in seronegative inmates.

Access to HIV and syphilis treatment is crucially needed. Women with untreated syphilis may contaminate their children in future pregnancies. We detected two cases of congenital syphilis in children under one year in the same prison during the study period, showing that perinatal transmission of syphilis may occur and should be prevented in this population²².

We also recommend to implement education campaigns designed to raise awareness on the transmission of STI and protection methods in prison. Indeed we observed a lack of knowledge on the transmission and prevention of STI among this population. Only a quarter of WDL knew the transmission and protection modes against HBV, while in prisons in USA over 75% of the population are well-informed⁸. Moreover, most of the participants reported a lack of information on STI, which highlighted the need of a specific education. This strategy should also take into account the high level of illiteracy in this population, which is higher than in the general population in Bolivia (2.9% according to the Ministry of Education in 2016).

Risk reduction programs should also be implemented. Access to condoms in prison is a key issue. The study reveals that the use of condoms is influenced by a lack of knowledge and difficult access. Enabling access to sterile equipment for tattoos would also be recommendable.

Limitations

Our study only collected data from one prison and thus was not representative of the whole imprisoned population of Bolivia. Nevertheless, the results showed that STI should be a major public health priority in prison.

CONCLUSION

WDL in the prison of Cochabamba represent a vulnerable population not only due to the high prevalence of syphilis, HSV2 and HIV but also due to the high number of risk factors. Prisons entail a unique opportunity to implement control measures within national strategical plans. These programs in prison would not only benefit to the imprisoned population, but also to the correctional staff, visitors and the whole community. Treatment of these conditions and the implementation of prevention measures would help to limit the spread of infectious diseases during the imprisonment and also after release.

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