Original article

RESP

Examining risk factors for HIV infection amongst male inmates in Peruvian prisons: A cross-sectional study using national prisoner census data

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ABSTRACT

Introduction: The prison population in Peru exceeds 90,000 individuals, many of whom face conditions that increase their vulnerability to human immunodeficiency virus (HIV), such as exposure to illicit substances, risky sexual behaviors, and discrimination.
Materials and Methods: A secondary analysis was carried out, using data from the 2016 national prison population census to identify factors associated with HIV risk in the incarcerated population of Peru. A total of 75,613 male inmates from prisons across the country participated, answering a comprehensive questionnaire consisting of 405 items. Multivariable regression Poisson models were used to calculate adjusted prevalence ratios (aPR) and 95% confidence intervals (CI).
Results: Our findings revealed significant associations between HIV risk and sexual orientation, with homosexual (aPR: 5.50; CI: 2.62-11.56) and bisexual (aPR: 4.92; 95% CI: 2.26-10.72) individuals being at higher risk. Additionally, a history of tuberculosis (aPR: 2.82; 95% CI: 1.75-4.56) and sexually transmitted diseases (aPR 48.14; 95% CI: 31.07-74.56) were strongly correlated with increased HIV risk. Marital status, specifically being widowed, divorced, separated, or single, also showed a statistically significant association with HIV infection in both raw and adjusted regression models.
Discussion: Our study highlights important risk factors for HIV infection among the male prison population in Peru. The identified associations will inform the development of effective health policies aimed at identifying and addressing HIV transmission within the country's prisons. Furthermore, our findings provide a basis for future research in similar settings with a comparable male prison population profile.

Key words: HIV; prisoners; epidemiology; risk factors.

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INTRODUCTION

The worldwide rate of incarceration has surged to an unprecedented level, with over 11 million individuals currently imprisoned. This figure has experienced a notable rise of 20% from 2002 to 2020. Furthermore, the prevalence of HIV in prison populations is particularly pronounced in sub-Saharan Africa, Europe, and Central Asia[1]. The prevalence of HIV among incarcerated individuals worldwide exhibits a range that is 2 to 10 times, and occasionally even 50 times, higher than that of the general community. Moreover, the risk of this population acquiring HIV infection may be five times greater than in non-incarcerated individuals[2,3].

Approximately 50% of new HIV cases are primarily attributed to transmission among people who engage in intravenous drug use[4,5]. Incarcerated individuals who experience heightened discrimination and sexual violence are at an increased risk of acquiring HIV. Factors contributing to transmission include limited awareness of HIV infection, engaging in unprotected sexual intercourse, engaging in high-risk sexual behaviors, inadequate gender-based prison classification, and restricted access to medical care within correctional facilities[6].

In Latin America, an estimated 2 million individuals are incarcerated. Within this population, there exists a wide range of co-infection rates between HIV and TB.[1,7,8], sexually transmitted infections, etc[6,9]. In some Brazilian prisons, the prevalence of co-infection between HIV and TB has reached as high as 5%. The transmission of HIV in these settings is facilitated by factors such as overcrowding, intravenous drug use, engagement in the sex trade, and occurrences of sexual abuse[10-13].

In Peru, the prison population exceeds 90,000 individuals, predominantly comprising men. These prisoners endure extreme conditions characterized by overcrowding, marginalization, unnecessary health risks, and heightened exposure to factors that facilitate contagion[14-16]. All these conditions put them at increased risk of infection with different infectious diseases, including HIV[17]. In the context of Peruvian male prisoners, there is currently a lack of original studies examining the factors associated with HIV infection, despite the vulnerability of this population. As a result, the objective of this study is to identify and determine these factors among incarcerated males in Peru.

MATERIAL AND METHOD

A cross-sectional study was undertaken, utilizing data from the 2016 National Prison Population Census, with the aim of obtaining statistical insights into the sociodemographic characteristics of adults incarcerated across the 66 prisons in the country.

A total of 76,143 male and female inmates participated in the study (71,569 men and 4,574 women), providing responses to a comprehensive questionnaire comprising 405 questions. These questions related to several aspects, including living conditions within the prison, sanitary conditions, and their legal status. The collected data formed a publicly accessible database within the National Institute of Statistics and Informatics (INEI).

Our focus is on male prisoners in this secondary analysis of the database. We investigate the risk of HIV infection based on the existing literature and a directed acyclic graph (DAG). Specifically, we examine the association between HIV infection and sociodemographic variables such as gender identity, age, marital status, and level of education.

Additionally our analysisincluded health-related variables such as the history of TB, sexually transmitted diseases, and addiction to psychoactive substances. We also considered behavioral variables such as relationships with classmates involved in legal issues during secondary school, family environment, involvement in minor criminal activities, gang affiliation, and experiences of discrimination within the family. These variables were examined to better understand their potential associations with HIV infection among male prisoners.

The outcome variable in this study was assessed through self-reporting using the question: "Do you have HIV/AIDS?" The remaining variables were obtained from specific questions within the questionnaire administered to all inmates in the prison system.

Statistical analysis

For the analysis, we employed the statistical software STATA v. 17 (© 2021 StataCorp LLC). Bivariate analysis of qualitative variables was conducted using Fisher's chi-square test or exact test, depending on the specific circumstances of the data.

To estimate the odds of having a positive HIV test and corresponding 95% confidence intervals, a Poisson-type Generalized Linear Model (GLM) regression model with robust variances was employed. In the multivariate analysis, all relevant factors were included for adjustment. A p-value of less than 0.001 was considered statistically significant in this study.

Ethical aspects

The authors of this study obtained approval for submission to a scientific journal from the University Continental Ethics Committee. The approval letter bears the reference number: N°003-2023-CIEI-UC.

RESULTS

According to the 2016 national census, the national prison population consisted of 75,613 male prisoners across 66 prisons in the country, including the Callao Naval Base. The male population (as shown in Table 1) was predominantly heterosexual (98.38%). The age distribution of the population indicated a proportional representation of young individuals, with 49,551 falling within the 18-40 years age range. The marital status was evenly distributed between those who had a partner and those who did not. Furthermore, the majority of the male prisoners had attained at most a secondary level of education (76.62%).

The male prison population under study exhibits several noteworthy characteristics. A

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considerable percentage of individuals experienced early abandonment from their homes (34.95%), and a substantial proportion has a history of committing offences (35.71%). Additionally, almost half of the inmates have been involved in gangs (47.09%), and a small percentage shared a common addiction to psychoactive substances (2.09%). Moreover, a significant portion of this population reports a heightened sense of discrimination (13.20%).

In terms of their clinical history, a small fraction of male prisoners have been diagnosed with HIV (0.43%), while a slightly higher proportion has a history of STD(0.78%). Furthermore, a notable percentage has been affected by TB (4.52%).

The bivariate analysis (Table 2) reveals statistically significant associations between HIV and several factors. These factors include sexual identity, marital status, history of TB, history of sexually transmitted diseases, addiction to psychoactive substances, leaving home before the age of 15, participation in minor crimes, participation in gangs, and experiences of discrimination.

Table 3 clearly shows that factors such as sexual orientation (being sexual or bisexual), having a history of TB, having a history of sexually transmitted diseases, and being widowed, divorced, separated, or single are consistently associated with HIV infection in both the raw and adjusted regression models.

DISCUSSION

This study is a pioneering analysis conducted at census level, utilizing an extensive secondary database of male prisoners in Peru. The primary objective of this research is to investigate and identify the diverse risk factors associated with HIV infection within the incarcerated population. By employing a census-level analysis, this study aims to offer a comprehensive understanding of the factors contributing to HIV transmission and prevalence among incarcerated males in Peru.

This study uncovered a significant finding concerning the risk of HIV infection among male prisoners, particularly in relation to sexual orientation. Our research reveals that homosexual prisoners face a risk of HIV infection that is four times higher than it is amongst their heterosexual counterparts. Moreover, bisexual males exhibit a risk of HIV infection that is five times higher. These findings support prior studies highlighting the association between gender identity and an elevated risk of acquiring HIV18-20.

Table 1. Demographic and clinical characteristics of male prisoners surveyed in the First National Prison Population Census 2016, Peru (n = 71,569)†

Variable	n (%)
HIV	
No	70,782 (99.57)
Yes	305 (0.43)
Sexual Identity	
Heterosexual	53,335 (98.60)
Bisexual	480 (0.89)
Homosexual	277 (0.51)
Age	
Under 20 years old	2,454 (3.43)
21-40 years	47,097 (65.81)
41-60 years	19,586 (27.37)
61 years or older	2,431 (3.40)
Marital status	
Cohabitant/Married	36,405 (50.87)
Widowed/Divorced	1,469 (2.05)
Separated/Single	33,694 (47.08)
Educational level	
Illiterate	1,465 (2.05)
Incomplete/Complete Primary	17,514 (24.47)
Incomplete/Complete Secondary	42,288 (50.09)
Higher	
Incomplete/Complete/Postgraduate	8,563 (12.26)
Tuberculosis	
No	67,855 (95.48)
Yes	3,210 (4.52)
Sexually Transmitted Diseases	
No	70,580 (99.22)
Yes	558 (0.78)
Addiction to psychoactive substances	
No	68,956 (97.06)
Yes	2,091 (2.94)
Leaving home before 15	
No	46,215 (65.05)
Yes	24,833 (34.95)
Involvement in Offences	
No	45,436 (64.29)
Yes	25,233 (35.71)
Gang Involvement	
No	37,607 (52.91)
Yes	33,466 (47.09)
Feeling of discrimination	
No	62,023 (86.85)
Yes	9,393 (13.15)

Note. † Some variables may add up to less than 71,569 for missing data.
Source: National Prison Population Census 2016. Available in: https://webinei.inei.gob.pe/anda_inei/index.php/catalog/268/study-description#page=overview&tab=study-desc

The findings support the notion that sexual orientation plays a crucial role in HIV transmission dynamics within the prison setting. The elevated risk observed among homosexual and bisexual males highlights the need for targeted interventions and tailored healthcare services to address the specific needs of these subpopulations. By recognizing and addressing the unique risk factors associated with different sexual orientations, effective strategies can be developed to mitigate the risk of HIV transmission and promote overall health and well-being among male prisoners[21-26].

In the United States, the prevalence of HIV among incarcerated individuals who identify as homosexual or bisexual is reported to be 13%. Additionally, in Argentine prisons, there is a high prevalence of HIV infections among transgender individuals, with approximately 54% of transgender prisoners being affected by the disease. Furthermore, men who have sex with men (MSM) are particularly vulnerable to HIV transmission within the prison system. This vulnerability is attributed to factors such as sexual abuse experienced in prisons and engaging in unprotected sexual intercourse. A study conducted in Los Angeles revealed that at least 35% of imprisoned MSM individuals have engaged in unprotected sex, while 75% reported having had anal sex. Alarmingly, 32% of respondents in this study were found to be HIV positive[27-30].

In Spain, 34.7% of MSM prisoners engage in high-risk sexual behaviors for HIV transmission. Similarly, in the United States, this percentage is even higher, reaching 53%. In Brazil and the United States, a significant proportion of incarcerated individuals, up to 8.2% and 51.2% respectively, reported engaging in anal sex prior to their imprisonment. It is worth noting that sexual practices within the prison environment also contribute to the risk of HIV transmission, as reported in Mexico with a prevalence of 32.9%. These findings highlight the importance of targeted interventions and comprehensive healthcare strategies to address the specific needs and risks associated with sexual behaviors among MSM prisoners[31-33].

Our study identified a significant link between incarceration and a prior history of sexually transmitted diseases (STDs), significantly associated with an increased risk of contracting HIV. This heightened likelihood among incarcerated individuals stems from an incomplete understanding of how diseases spread through bodily fluids. This lack of comprehension not only hinders knowledge of transmission methods but also leads to risky behaviors within correctional facilities, such as engaging in multiple sexual partnerships, experiencing sexual abuse, and practicing unprotected intercourse[34-36].

The link between STDs and HIV infection stems from their shared mode of transmission through sexual contact. Additionally, certain STD infections like herpes simplex virus type 2 (HSV-2), syphilis, or lymphogranuloma venereum (Chlamydia trachomatis) cause ulcers in the genital, rectal, and oral regions, thereby increasing the risk of HIV transmission. Elevated rates of STDs indicate engagement in risky, unprotected sexual behaviors, which are particularly important in populations facing social vulnerability, such as individuals from the LGBTI community[37-39].

These identified risk factors within the prison environment surpass the impact of the broader community setting. Moreover, the United States reports high rates of chlamydia and gonorrhea among inmates, further highlighting the vulnerability to STDs within correctional facilities. These findings emphasize the urgent need for comprehensive education programs, accessible healthcare services, and targeted interventions that address the specific challenges faced by incarcerated individuals to mitigate the risk of HIV transmission and other STDs within the prison population[40-42].

In our analysis, a notable observation emerged indicating that male prisoners with a history of TB are at a heightened risk, being more than twice as likely to acquire HIV. This observation resonates with global data emphasizing the substantially elevated risk of TB transmission within carceral environments, which stands at 26 times higher compared to the non-incarcerated population. Factors such as overcrowding, inadequate infrastructure, poor ventilation, and limited physical distancing within prisons significantly contribute to this increased risk as noted in several studies recently published in Ethiopia and Thailand[36,43,44].

By way of contrast, our findings diverge from a study conducted in Tanzania, where more than 25% of TB-diagnosed prisoners were also found to be HIV positive. In Africa, the prevalence of HIV among TB patients surpasses 40%, a trend possibly linked to prolonged durations of imprisonment and higher turnover rates among inmates. The confluence of high HIV and TB prevalence within prisons underscores the critical issue of limited accessibility to prevention, diagnosis, and treatment services for these diseases in these settings[45-50].

Despite the valuable insights gained from our study, it is important to acknowledge its limitations.

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Firstly, the reliance on self-reported survey data introduces the potential for information and memory biases, as respondents may not accurately recall or disclose certain details. Additionally, the absence of laboratory confirmation for certain diagnoses may introduce biases in the data collection process. Additionally, the survey's characteristics meant that it was unfeasible to detect different types of sexually transmitted diseases or patterns of intravenous drug use. Therefore, we believe that these aspects should be

Table 2. Bivariate analysis of HIV/AIDS-associated characteristics in male prisoners (n = 75,613).

Characteristics	HIV/AIDS		*p*
	No (n = 75,256) n (%)	Yes (n = 357) n (%)	
Sexual Identity			<0.001
Heterosexual	52,904 (99.6)	192 (0.4)	
Bisexual	459 (95.8)	20 (4.2)	
Homosexual	255 (92.1)	22 (7.9)	
Age			0.015
Under 20 years old	2,426 (99.8)	4 (0.2)	
21-40 years	46,590 (99.6)	199 (0.4)	
41-60 years	19,362 (99.5)	98 (0.5)	
61 years or older	2,404 (99.8)	4 (0.2)	
Marital status			<0.001
Cohabitant/Married	36,071 (99.7)	99 (0.3)	
Widowed/Divorced	1,430 (98.6)	20 (1.4)	
Separated/Single	33,281 (99.4)	186 (0.6)	
Educational Level			0.093
Illiterate	1,436 (99.2)	11 (0.8)	
Incomplete/Complete Primary	17,354 (99.6)	79 (0.5)	
Incomplete/Complete Secondary	41,945 (99.6)	166 (0.4)	
Higher Incomplete/Complete/Postgraduate	8,490 (99.7)	29 (0.3)	
Tuberculosis			<0.001
No	67,375 (99.7)	229 (0.3)	
Yes	3,129 (97.7)	73 (2.3)	
Sexually Transmitted Diseases			<0.001
No	70,137 (99.7)	201 (0.3)	
Yes	452 (81.6)	102 (18.4)	
Addiction to psychoactive substances			<0.001
No	68,438 (99.6)	254 (0.4)	
Yes	2,027 (97.7)	48 (2.3)	
Leaving home before 15			<0.001
No	45,874 (99.7)	145 (0.3)	
Yes	24,556 (99.4)	158 (0.6)	
Involvement in Offences			<0.001
No	45,092 (99.7)	151 (0.3)	
Yes	24,959 (99.6)	152 (0.4)	
Gang Involvement			<0.001
No	40,411 (99.2)	138 (0.8)	
Yes	34,467 (98.9)	216 (0.6)	
Feeling of discrimination			<0.001
No	37,332 (99.7)	112 (0.3)	
Yes	33,117 (98.4)	191 (0.6)	

Note. † Some variables may add up to less than 71,569 for missing data.

further explored in future national surveys to attain a more in-depth understanding.

Notwithstanding these limitations, we believe that our study provides a valuable contribution by offering a comprehensive understanding of HIV-related prison health among male prisoners. The findings of this study can serve as a global reference point for future research and inform decision-making processes by authorities responsible for prison healthcare. By recognizing the limitations of this study, future investigations can focus on refining methodologies and addressing these limitations to further enhance our understanding of HIV prevention, treatment, and care within correctional settings.

On the other hand, the utilization of a secondary database allows for a large sample size and

Table 3. Association between HIV outcome and associated factors in male prisoners, epidemiological approach.

Characteristics	Bivariate analysis			Multiple regression*		
	PR	IC 95%	*p*	aPR	IC 95%	*p*
Sexual identity						
Heterosexual	Ref.	*****	***	Ref.	***	***
Bisexual	11.55	7.35-18.14	<0.001	5.50	2.62-11.56	<0.001
Homosexual	21.96	14.36-33.60	<0.001	4.92	2.26-10.72	<0.001
Age						
Under 20 years old	Ref.	*****	***	Ref.	***	***
21-40 years	2.58	0.96-6.95	0.060	4.29	0.59-30.91	0.149
41-60 years	3.06	1.13-8.31	0.028	5.72	0.77-42.36	0.088
61 years of age or older	1.00	0.25-4.03	0.990	1.79	0.11-30.32	0.688
Marital status						
Cohabitant/Married	Ref.	*****	***	Ref.	***	***
Widowed/Divorced	5.04	3.13-8.12	<0.001	6.65	2.96-14.98	<0.001
Separated/Single	2.03	1.59-2.59	<0.001	2.00	1.38-2.89	<0.001
Drug addiction						
No	Ref.	*****	***	Ref.	***	***
Yes	6.25	4.61-8.49	<0.001	1.21	0.63-2.31	0.570
Feeling of discrimination						
No	Ref.	*****	***	Ref.	***	***
Yes	2.27	1.76-2.99	<0.001	0.75	0.46-1.20	0.228
Gang Involvement						
No	Ref.	*****	***	Ref.	***	***
Yes	1.91	1.52-2.42	<0.001	1.70	1.13-2.54	0.010
Involvement in Offences						
No	Ref.	*****	***	Ref.	***	***
Yes	1.81	1.45-2.27	<0.001	0.95	0.64-1.42	0.813
Leaving home before 15						
No	Ref.	*****	***	Ref.	***	***
Yes	2.02	1.62-2.54	<0.001	1.54	1.06-2.22	0.021
STD						
No	Ref.	*****	***	Ref.	***	***
Yes	64.43	51.54-80.54	<0.001	48.14	31.07-74.56	<0.001
Tuberculosis						
No	Ref.	*****	***	Ref.	***	***
Yes	6.73	5.18-8.74	<0.001	2.82	1.75-4.56	<0.001

Note. **Adjusted by Sexual identity, Age, Marital status, Drug addiction,Sense of discrimination, Gang Involvement, Involvement in Offences,History of leaving home before 15, STD, Tuberculosis. *** Educational level excluded due to collineality. PR: Prevalence ratio. 95% CI: 95% confidence interval; aPR : Adjusted prevalence ratio.

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comprehensive coverage of the prison population, providing a robust foundation for analysis. By examining a wide range of sociodemographic, health-related, and behavioral variables, this study seeks to identify potential associations and risk factors linked to HIV infection. The inclusion of variables such as gender identity, age, marital status, level of education, history of TB, sexually transmitted diseases, addiction to psychoactive substances, and experiences of discrimination within the analysis ensures a comprehensive exploration of potential risk factors.

Understanding the specific risk factors associated with HIV infection among male prisoners is crucial for the development of targeted interventions and policies to prevent and manage HIV transmission within correctional facilities. Findings from this study can contribute to the existing body of knowledge, inform evidence-based strategies for prevention and treatment, and ultimately contribute to improved healthcare and well-being of incarcerated individuals.

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The authors confirm that there are no relevant financial or non-financial competing interests to report.

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