Late Diagnosis of HIV Infection among Prisoners

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Abstract

HIV-risk populations are over-represented in prisons. It is very important to identify late HIV infection diagnosis in this setting from a public health perspective. The objectives of this study are to estimate the prevalence of late diagnosis and identify the predictive factors among inmates of two prisons in Barcelona from 2010 to 2012, and to review late diagnosis in other prisons. A cross-sectional study design was used on inmates with newly-diagnosed HIV infection. Less than 350 CD4 lymphocytes/µl was considered late diagnosis. A Medline search was performed. Of the 3,933 total inmates, 1.2% (n = 47) were diagnosed with HIV infection, 1.7% from Prison A and 0.6% from Prison B (p < 0.001). Late diagnosis occurred in 47.7% of cases. A higher number of cases with late diagnosis were found in Prison A, among the immigrant population, and among intravenous drug users (p = 0.026, p = 0.007, p = 0.03, respectively). The proportion of late diagnosis decreased from 60% in 2010, to 44.4% in 2011 and 20% in 2012 (p = 0.05). The multivariate analysis confirmed an association between late diagnosis and immigrant status (OR: 7.85; 95% CI: 1.8-34.13) and the declining prevalence (p = 0.032). This is the first study to estimate late diagnosis in a prison population. Late diagnosis occurs mainly among the immigrant inmate population. The prison can serve as an opportunity to identify and treat HIV infection among people who have little contact with health services, thus avoiding further transmission. (AIDS Rev. 2013;15:146-51)

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Key words

HIV. Late diagnosis. Prison.

Introduction

Undiagnosed HIV infection is a serious problem for patients and for public health because it permits increased infection transmission, morbidity/mortality, and future costs of care and treatment. Though the use of antiretroviral treatment (ARV) improves survival, later initiation of treatment decreases immunological recuperation for the patients[1]. Furthermore, the status of the infected patient and their access to health services must be known to accurately assess the benefits of ARV.

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The health services at penitentiaries are often in contact with a high-risk population for HIV infection and therefore play an important role in the early diagnosis of HIV[2]. For example, one study carried out in Spain found that current or previous imprisonment was associated with early HIV infection diagnosis after adjusting for other variables[3]. In Spain, inmates who do not know their serological status are offered a voluntary HIV, syphilis, hepatitis B, and hepatitis C screening when admitted to prison. Annual blood work is performed on inmates with negative results and high-risk behavior as well as on inmates who request it. Currently, HIV serology status is known for 85.16% of the prisoners in Catalonia[4], the Autonomous Community that is directly responsible for penitentiary centers. These centers offer ARV treatment, prophylaxis against opportunistic infections according to current recommendations, and regular follow-up for CD4 T-cell lymphocyte count. Thus, prisons provide a unique opportunity to diagnose, treat,

and implement effective interventions. However, the role of prisons in HIV detection has yet to be examined.

The objective of this study is to determine the proportion of late HIV infection diagnosis (LD) and the associated factors among a population of newly diagnosed prisoners from two prisons, and to review LD among other prison populations.

Late diagnosis of HIV infection

Despite the importance of early diagnosis, an estimated 50% of HIV-infected individuals in the European Union are diagnosed late (< 350 CD4 T-cell lymphocytes/μl)[5]. Late diagnosis was defined as a CD4 lymphocyte count < 350 cells/μl and advanced infection was defined as a CD4 lymphocyte count < 200 cells/μl and/or presence of AIDS diagnosis criteria[6] within a month since HIV infection diagnosis.

Materials and methods

A cross-sectional study was carried out over 36 months (01 January, 2010 to 31 December, 2012) at two penitentiary centers of Barcelona: Prison A and Prison B. Prison A is located in the city of Barcelona and houses recently detained prisoners. The average number of inmates in 2010-2012 was 1,666/day. Prison B is located in La Roca del Vallés in the province of Barcelona and houses convicted prisoners. These prisoners have an assigned sentence that is carried out at the current facility or, more often, a different facility which is assigned after court. The average number of inmates at Prison B in 2010-2012 was 1,583/day. Both prisons house male inmates only.

Our study reviewed the new HIV infection diagnoses, which were detected on routine laboratory analyses obtained according to clinical practice at both facilities and confirmed by Western Blot. The rates of LD and advanced infection were calculated. The following variables were collected from electronic medical records: age, country of origin, mode of transmission, CD4 lymphocyte count/μl, HIV viral load, AIDS diagnosis, and hepatitis A, C, and syphilis serology.

We used the following terms in a Medline search: HIV, prisons, penitentiary centers, late presenter/presentation, advanced infection.

Statistical analysis

The descriptive data was expressed as absolute number, percentage, average, and standard deviation.

The χ^2 test and exact Fisher test were used to compare the qualitative variables. The odds ratio (OR) and 95% confidence intervals (95% CI) were calculated as measurement of association. A bivariate analysis was performed to identify the predictive variables and a multivariate analysis was performed on variables with p < 0.15 on the univariate level using a logistic regression and adjusted odds ratio (AOR) and 95% CI.

The statistical analysis was performed using SPSS (v18) (SPSS Inc., Chicago, IL, USA).

Ethical aspects

This investigation was carried out according to the international ethical recommendations of the Declaration of Helsinki and Oviedo Convention, and according to the Guidelines of Good Clinical Practice, RD 711/2002 and current legislation in Spain (Circular 15/2002). Handling, communication, and disposal of personal data for all participating individuals was performed according to Organic Law 15/1999, 13 December, regarding the protection of personal data. The study was approved by the Justice Department of the Catalan Government.

Results

A total of 3,933 subjects were included in the study, 2,048 in Prison A and 1,885 in Prison B. Forty seven cases (1.2%) yielded positive HIV serology, 35 (1.7%) in Prison A and 12 (0.6%) in Prison B (OR: 2.68; 95% CI: 1.41-5.37). The HIV-infected individuals were an average of 34.4 ± 7.4 years of age. Of the 49.9% HIV-infected immigrants, 50% were Romanian, 15.5% were Moroccan, 8.3% were Russian, and the rest were from various other countries. Regarding mode of transmission, 55.3% were infected by shared injection drug equipment, 31.9% through unprotected heterosexual relations, 4.2% through homosexual or bisexual relations, and 8.5% through unknown means.

The CD4 lymphocyte/μl count was not obtained for three cases (6.4%) because the subjects were released before the study analysis was performed. Among the HIV-infected individuals with CD4 data (n = 44), the average CD4 count was 345.5 CD4 lymphocytes/μl (range 0.5-1,140). Regarding coinfections, 63.8% were coinfected with hepatitis C, 6.4% were infected with hepatitis B, and 4.3% presented with positive syphilis serology at the time of HIV diagnosis.

There were four cases (75% immigrants, all with < 200 CD4 lymphocytes/μl) with a history of opportunistic

Table 1. Epidemiological characteristics of the HIV-infected population according to type of prison

Variable	Total (n = 47) (%)	Prison A (n = 35) (%)	Prison B (n = 12) (%)	p-Value	Odds ratio (95% CI)
Age, mean years	34.4 ± 7.4	32.5 ± 6.1	40.08 ± 7.9	0.001	
CD4+/ µl (median)	339.9	303.6	456.3	0.009	
Spanish born	24 (51.1)	13 (37.1)	11 (91.7)	0.001	0.05 (0.00-0.47)
History of IDU	26 (55.3)	24 (68.6)	2 (16.7)	0.005	10.91 (1.74-87.45)
LP	21 (47.7)*	19 (57.6)†	2 (18.2)‡	0.05	6.11 (0.97-48.83)
AI	17 (38.6)*	17 (51.5)†	0 (0)‡	0.002	–
AIDS	4 (8.5)	4 (11.4)	0 (0)	0.29	–
HBsAg+	3 (7.1)§	2 (6.7)¶	1 (8.3)	0.80	0.79 (0.05-24.44)
Anti HCV+	30 (66.7)¶	24 (72.7)†	6 (50)	0.14	2.67 (0.56-13.04)
Syphilis serology+	2 (4.7)**	2 (6.1)†	0 (0)	0.53	–

*of 44 studied.
†of 33 studied.
‡of 11 studied.
§of 42 studied.
¶of 45 studied.
**of 43 studied.
IDU: intravenous drug use; LP: late presenter; AI: advanced infection.

infections: two with pulmonary tuberculosis, one with *Pneumocystis jiroveci* pneumonia and one with disseminated Cryptococcus infection).

The HIV-infected patients at Prison A were younger, more often born outside the Spain, and more frequently intravenous drug users (IDU), and presented with a lower average of CD4 lymphocytes/µl. Results of all variables can be seen in table 1.

Late diagnosis was identified in 47.4% of the HIV-infected subjects, with an average age of 33.9 ± 8.3 years. A decline in the proportion of LD was observed throughout the study period (Fig. 1): 60% in 2010, 44.4% in 2011, and 20% in 2012 (p = 0.05). A similar decline was observed in Prison A (76.5% in 2010, 50% in 2011, and 30% in 2012; p = 0.01), but not in Prison B (16.7% in 2010, 33.3% in 2011, and 0% in 2012; p = 0.71)

Late diagnosis was found more often in Prison A (59.6%) than in Prison B (18.2%) (p = 0.026), as well as among immigrants (68.2%) compared to those born in Spain (27.3%) (p = 0.007) and among IDU (62.5%) compared to non-IDU (30%) (p = 0.03). Immigrant status was confirmed as independently associated with LD by the multivariate analysis (Table 2).

Seventeen (38.6%) of the newly HIV-infected subjects presented with an advanced infection. All of these cases were found in Prison B and were more frequently immigrants and IDU. Immigrant status was confirmed as independently associated with advanced infection (Table 2).

We didn't find any other articles pertaining to this subject in our Medline search.

Discussion

The proportion of new HIV infection diagnoses in the study population (1.2%) is three times higher than the estimated prevalence of HIV infection diagnosis among the general population in Spain (0.4%)[7], and is also higher than that reported among inmates in the USA (0.7%)[8]. Nonetheless, the prevalence in our study actually represents a lower figure than that of Spanish prisons in the 1980s, which surpassed 40%[9]. Screening inmates for HIV infection continues to be a key aspect to the detection of HIV infection.

The opt-out HIV screening strategy is cost-effective when the detection rate is 0.1% or higher[10]. Thus, we believe the prevalence of HIV infection in the study population (1.2%) justifies the routine use of this screening strategy. It is also important to note that we found remarkable differences between the two prisons;

Table 2. Variables associated with late presenter and with advanced infection in prisoners; bivariate and multivariate analysis

Predictors of late presentation

Variable	Bivariate analysis		Multivariate analysis	
	Late presentation, n (%)	p-Value	p-Value	AOR (95% CI)
Penitentiary centre		0.026		
– Prison A	19 (59.6)			
– Prison B	2 (18.2)			
Spanish-born		0.007	0.006	
– Yes	6 (27.3)			1
– No	15 (68.2)			7.85 (1.80-34.13)
History of IDU		0.03		
– Yes	15 (62.5)			
– No	6 (30.0)			
HbsAg positive		0.18		
– Yes	2 (100)			
– No	17 (44.7)			
Anti HCV positive		0.19		
– Yes	16 (55.2)			
– No	5 (35.7)			
Lues serology positive		0.25		
– Yes	0 (0)			
– No	20 (51.3)			
Year of late presentation		0.05	0.032	
– 2010	14 (60.9)			6.73 (1.11-40.75)
– 2011	4 (44.4)			2.31 (0.35-15.14)
– 2012	3 (20.0)			1

Predictors of advanced infection

Variables	Bivariate analysis		Multivariate analysis	
	Advanced infection, n (%)	p-Value	p-Value	AOR (95% CI)
Penitentiary centre		0.002		
– Prison A	17 (51.5)			
– Prison B	0 (0)			
Spanish-born		0.006	0.047	
– Yes	4 (18.2)			1
– No	13 (59.1)			4.48 (1.02-19.65)
History of IDU		0.021		
– Yes	13 (54.2)			
– No	4 (20,0)			
HbsAg positive		0.41		
– Yes	1 (50,0)			
– No	14 (36.8)			
Anti HCV positive		0.24		
– Yes	13 (44.8)			
– No	4 (28.6)			
Lues serology positive		0.29		
– Yes	0 (0)			
– No	17 (45.9)			

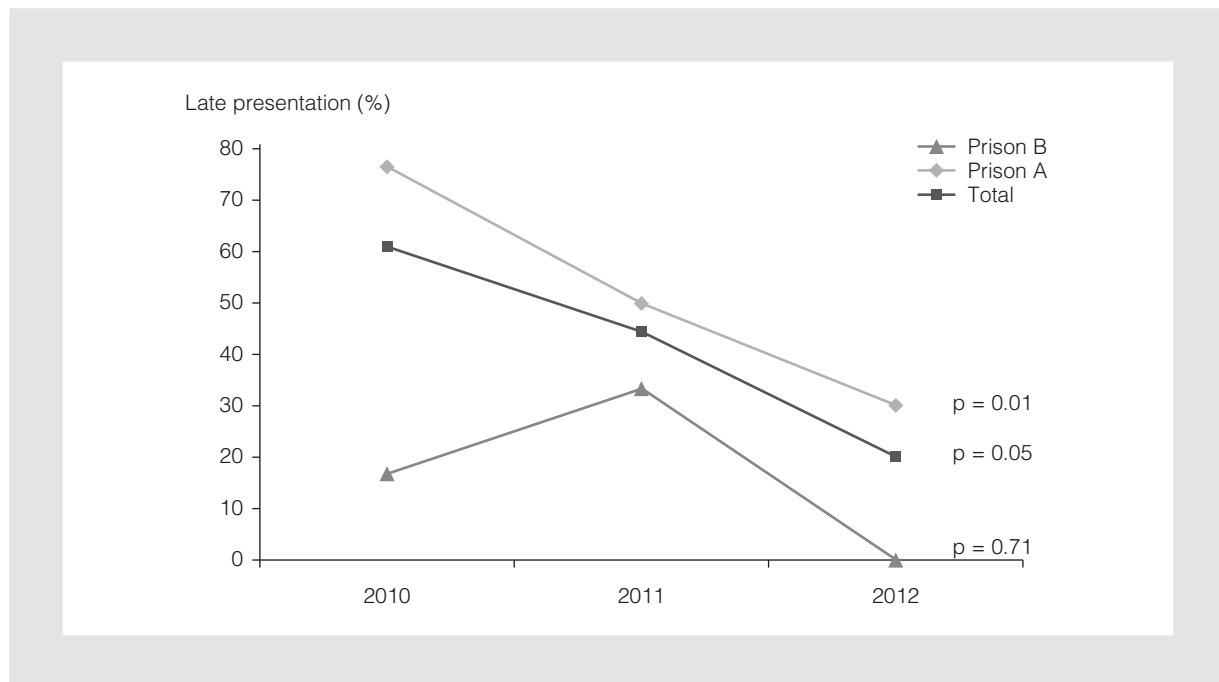IDU: intravenous drug use. AOR: adjusted odds ratio.

Figure 1. *Evolution of late presentation in Prison A, Prison B, and both.*

the prevalence of HIV infection was almost triple in Prison A, housing recently detained individuals, than in Prison B, housing sentenced inmates. A likely explanation is that the recently detained inmates currently or recently practiced high-risk behavior such as IV drug use, whereas the sentenced inmates have been imprisoned for a longer time and practice high-risk behavior less frequently. Additionally, the sentenced inmates may have already undergone HIV screening. Prison B, housing sentenced inmates, provides methadone treatment and a needle exchange for IDU, which is the subgroup most affected by HIV infection in Spanish prisons.

Late diagnosis was detected in 47.7% of the new HIV infection diagnoses. We cannot compare this data to other literature because the present study is the first to estimate LD in a prison population. The proportion of LD observed in our study is similar to that of LD estimated for Spain in 2011 (46.5%)[11] and also to the range estimated in Ireland, Germany, and the European Union (44-55%)[5,12,13]. Our rate of LD is also very similar to the diagnostic delay reported in Barcelona in 2009 (48.6%)[14], where the two prisons included in the study are located.

We also found an association between LD and immigrant status. The published data from Barcelona identified immigrant status, advanced age, IDU, and transmission by heterosexual relations as predictive variables[14]. The association between LD and immigrant

status, as well as with ethnicity in the southern USA, has been discussed in literature from Spain[15-17] and from other countries[13,18-20]. In our opinion, this is an important finding because the immigrant subgroup may have difficulty accessing healthcare services, which could in turn cause a diagnostic delay. Furthermore, our study identified immigrant status as associated with both LD, presenting with an advanced infection and AIDS as independent predictive variables.

Regarding mode of transmission, the results of the bivariate analysis showed that transmission by IDU is most frequently associated with LD. The high probability of LD among IDU was also reported in a study from Italy, but only among IDU without access to healthcare resources[21]. This is a plausible explanation for our findings as well, especially since 86.7% of the immigrants with LD were also IDU.

The 38.6% of new HIV infection diagnoses presenting with an advanced infection found in our study is higher than that reported overall for Spain (29.1%)[11]. It is important to note that the presence of advanced infection correlates with poor immunological recuperation[1,22], high morbidity/mortality[16,23], and high economic costs for hospitalization and pharmacological treatment[24,25].

Finally, we observed a decline in LD among prisoners with a new HIV infection during the study period for the whole study population and for Prison A.

Because Prison A houses recently detained inmates, the decline in LD from this facility can be a marker for the LD of HIV infection among individuals who commit crimes. A high prevalence of IDU is typically found among this group and coincides with a decline in IDU reported by the Epidemiological Surveillance System in Spain[12] and in Europe, though the data for this subgroup is not as clear[26].

We consider the inclusion of data from only two prisons is a limitation of our study that could influence the relevance of our results for other prisons. Despite this limitation, Prison A admits more than 85% of the recently detained inmates in Catalonia and Prison B is similar to other Catalan prisons in terms of population characteristics. Thus we believe that the rate of new HIV infection diagnosis reported in our study could be used as an approximation for other prisons in the same region and other urban regions of Spain. Because of differences in penitentiary policies and the socio-cultural characteristics of the incarcerated population, we cannot generalize our results to inmates in other countries.

Conclusions

Late diagnosis of HIV infection is prisons occurred frequently and reached almost 50% of our study population, a similar proportion to data from non-incarcerated populations. Late diagnosis of HIV infection correlates with immigrant status and the presentation of advanced infection or AIDS at the time of diagnosis. We believe that entry into the penitentiary system also allows for better detection and early treatment among high-risk groups with little contact with the healthcare system, and thus avoids further transmission. This is the first study to estimate LD in prisons. More studies are needed in penitentiary centers considering the high concentration of populations at risk for HIV.

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