Multi-centre Study of the Prevalence of Infection from hiv and associated factors in Spanish prisons

Marco A¹, Saiz de la Hoya P², García-Guerrero³ J y Grupo PREVALHEP*

¹Servicios Sanitarios del Centro Penitenciario de Hombres de Barcelona
²Centro Penitenciario de Alicante I
³Centro Penitenciario de Castellón I

ABSTRACT

Objective: To determine the prevalence and associated factors of HIV infection amongst inmates in Spain.

Material and Methods: Observational and transversal study (June 2008). For 62,000 inmates an “n” of 364 was determined (5% variability, error correction α 5% and 10% missing). 18 prisons were randomly selected and 21 inmates/prison. Frequency measurement: prevalence. Magnitude of the association: odds ratio of prevalence (ORP) with 95%. Statistical significance p<0.05.

Results: 371 prisoners were studied (91.6% male, 66.9% ≤ 40 years, 60.6% Spanish, 23.5% IDU and 71.2% incarcerated <5 years). HIV prevalence was 10.8% (CI: 7.5 to 14). 85% were co-infected with HCV, 12.5% with HBV and HCV and 63.2% with M. tuberculosis. This represents a proportion to the prison population of 9.2%, 1.3% and 6.7% respectively. HIV infection was associated with: a) > 40 years (p <0.01), b) imprisoned > 5 years (p <0.001), c) non-Arab (p <0.01), d) Spanish nationality (p <0.001), e) IDUs (p <0.001), f) co-infected with HCV (p <0.001), and g) co-infected with HBV (p <0.001). Multivariate analysis confirmed the association: a) ≥ 40 years [OR = 2.66 (CI: 1.16-6.07), b) IDU [OR = 28.08 (IC-9.61-81.99), c) infected with HCV [OR = 6.96 (CI: 1.90-25.39)], and d) infected with HBV [OR = 13.52 (CI = 1.76-103.82).

Conclusion: The prevalence of HIV infection among prisoners in Spain is 10.8%. Those that are infected are usually IDUs and over 40 years. 85% are co-infected with HCV and 12.5% with HBV and HCV.

Keywords: Prisons; Epidemiology; Prevalence; HIV Antibodies; Aids Serodiagnosis; Prisoners; HIV.

INTRODUCTION

In Spain there are approximately 130,000 people infected with HIV¹, which represents a prevalence of infection of 2.7-3.7 cases per 1,000 inhabitants, and almost 80,000 cases of AIDS had been reported by 30th September 2010². In 2009, 2,264 new cases of infection were diagnosed, which means a rate of 79.3/million inhabitants³, which is a situation similar to the one in countries surrounding Spain, such as France, Belgium or Ireland, and lower than the one in Estonia, Lithuania, Portugal and the UK, but higher than the average for countries in the European Union⁴.

In the new diagnoses of HIV infection, transmission amongst men who have sexual relationships with other men is the most frequent at 42.5%, followed by...
heterosexuals at 34.5%, and finally infection caused by intravenous drug use (IDU) at 8.1%. Although the first years of the HIV infection epidemic in Spain had the greatest impact on IDUs, new cases amongst this group has been decreasing since the nineties\(^5,6\), probably because of the decreased use of IV amongst heroin abusers, the spread of methadone treatment programs, educational campaigns and a drop in young people consuming injected drugs. A reduction in HIV transmission amongst IDUs has also been observed amongst prison inmates\(^7\), which has presented important sociological changes in recent years: a modification of consumption patterns amongst Spanish substance abusers\(^8,9\), with lesser use of intravenous methods and an increase in foreign prisoners, who are generally less given to IDU\(^10\). It is highly likely that these sociological changes have meant important changes in the prevalence of HIV infection in the prison population. Consequently, the objective of our study is to estimate current prevalence, as well as the factors associated with HIV infection amongst prisoners in Spain.

**MATERIALS AND METHODS**

Sub-study of the PREVALHEP project, designed to measure the prevalence of infection from hepatotropic viruses, HIV and \(M.\) tuberculosis amongst Spanish prison inmates. This is an observational, cross-sectional study carried out in June 2008. The source of the data was the clinical histories of the included inmates, since anyone entering a Spanish prison is offered a voluntary serological study of this and other infections.

**Size of the sample.** A sample was taken by two-stage cluster sampling with probabilities proportional to the sizes of the first stage units (number of inmates per centre). The number of selected prisons was 18. The second stage consisted of the random selection of 21 inmates per included prison. The selected prisons were: Huelva, Cordoba, Almeria, Seville, Villabona (Asturias), Castellon, Leon, El Dueso (Cantabria), Ponent (Lerida), Topas (Salamanca), Brians (Barcelona), Caceres, Teixeiro (Corunna), Madrid II, Madrid VI, Murcia, Valencia y Fontcalent (Alicante I).

**Variables studied.** The variables collected and analysed were: a) socio-demographic variables (age, gender, race, nationality and intravenous drug use); b) those related to stay in prison (total time in prison and year of last entry); and c) clinical-serological (serologies of HIV, Hepatitis B and Hepatitis C, results of Mantoux intra dermal reaction and existence or not of previous tuberculosis).

**Statistical analysis.** The sample variables were described in the univariate study. The frequency measurement used was prevalence. To describe the quantitative variables the mean with standard deviation was used or median and percentiles. Comparison of medians between groups was made using Student’s t test. Analysis of association between qualitative variables was made with the chi squared test \((\chi^2)\). To quantify the magnitude of the association the crude odds ratio of prevalence was calculated (ORp) with confidence intervals of 95% (CI 95%) and with variables that had both ends of the CI 95% above or below the unit, the adjusted ORp was calculated using a multiple logistical regression model. The level of statistical significance in the hypothesis contrasts was \(p<0.05\). The statistical program used was the SPSS v.10.0.

**Legal and ethical considerations:** The patients included were informed and their consent was requested for use of their data, which was duly recorded in their clinical history. Administrative authorisation was requested from the General Secretary of Prisons of the Spanish Government and the Secretary for Prison Services, Rehabilitation and Youth Justice of the Regional Government of Catalonia. The study was evaluated by the Ethical and Clinical Research Committee of the Fundació Gol i Gorina of Barcelona.

**RESULTS**

378 inmates were selected, of which 371 (98.1%) were studied. There was a lesser study amongst inmates of Arab ethnicity (98.8% vs 94.7%) with statistically significant differences \((p=0.03)\).

The average age of the selected sample was 35.7 years \((DS +/− 10.3)\) and the average period of imprisonment, 3.6 years \((DS +/− 4.4)\). Most were men (91.6%), young \((66.9% ≤ 40\) years\) and Spanish \((60.6%)\). The foreigners in the sample were mostly North African \((35.2%)\) and Latin American \((32.4%)\), while the rest \((n=46; 32.4%)\) were from other geographical areas. By countries, the most numerous foreigners were Moroccan \((n=46; 32.4%)\). 23.5% had a background of IDU and 71.2% had been prisoners for less than 5 years. The socio-demographic characteristics of the studied population are shown in greater detail in table 1.
A Marco, P Saiz de la Hoya, J García-Guerrero y Grupo PREVALHEP. Multi-centre Study of the Prevalence of Infection from hiv and associated factors in Spanish prisons

<table>
<thead>
<tr>
<th>Variables</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>347</td>
<td>91.8</td>
</tr>
<tr>
<td>Women</td>
<td>31</td>
<td>8.2</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 40 years</td>
<td>253</td>
<td>66.9</td>
</tr>
<tr>
<td>&gt; 40 years</td>
<td>125</td>
<td>33.1</td>
</tr>
<tr>
<td>Origin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spanish</td>
<td>229</td>
<td>60.6</td>
</tr>
<tr>
<td>Foreigners</td>
<td>149</td>
<td>39.4</td>
</tr>
<tr>
<td>Race or ethnic background</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>284</td>
<td>75.1</td>
</tr>
<tr>
<td>Arabic</td>
<td>57</td>
<td>15.1</td>
</tr>
<tr>
<td>Negro</td>
<td>14</td>
<td>3.7</td>
</tr>
<tr>
<td>Gypsy</td>
<td>23</td>
<td>6.1</td>
</tr>
<tr>
<td>IDU background</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>87</td>
<td>23.2</td>
</tr>
<tr>
<td>No</td>
<td>291</td>
<td>76.8</td>
</tr>
<tr>
<td>Years in prison</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 5 years</td>
<td>269</td>
<td>71.2</td>
</tr>
<tr>
<td>≥ 5 years</td>
<td>109</td>
<td>28.8</td>
</tr>
</tbody>
</table>

IDU: Intravenous drug user

Table 1. Descriptive characteristics of the studied sample.

![Diagram showing proportions of people infected by HIV, HBV, HCV, and MT, as well as co-infected with HIV and MT, in the prison population of Spain.]

Table 2 Variables associated with HIV infection (bivariate analysis)

<table>
<thead>
<tr>
<th>Variables</th>
<th>HIV+ n=40</th>
<th>HIV– n=331</th>
<th>Value “p”</th>
<th>OR (CI 95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>39.2 (+/-7.3)</td>
<td>35.4 (+/-10.5)</td>
<td>0.002</td>
<td>1.03 (1-1.06)</td>
</tr>
<tr>
<td>Years in prison</td>
<td>7.7 (+/-6.8)</td>
<td>3.1 (+/-3.6)</td>
<td>&lt;0.001</td>
<td>1.2 (1.1-1.3)</td>
</tr>
<tr>
<td>Male</td>
<td>82 (95)</td>
<td>302 (91.2)</td>
<td>0.4</td>
<td>1.8 (0.4-8)</td>
</tr>
<tr>
<td>From North Africa or Middle East</td>
<td>0 (0)</td>
<td>54 (16.3)</td>
<td>0.006</td>
<td></td>
</tr>
<tr>
<td>Spanish</td>
<td>364 (90)</td>
<td>189 (57.1)</td>
<td>&lt;0.001</td>
<td>6.8 (2.4-19.4)</td>
</tr>
<tr>
<td>IDU</td>
<td>34 (85)</td>
<td>53 (16.1)</td>
<td>&lt;0.001</td>
<td>29.5 (11.8-73.8)</td>
</tr>
<tr>
<td>HCV co-infection</td>
<td>36 (85)</td>
<td>48 (14.5)</td>
<td>&lt;0.001</td>
<td>31.7 (12.6-79.5)</td>
</tr>
<tr>
<td>HBV co-infection</td>
<td>5 (12.5)</td>
<td>4 (1.2)</td>
<td>&lt;0.001</td>
<td>10.6 (2.7-41.5)</td>
</tr>
<tr>
<td>Entered prison before 2007</td>
<td>23 (57.5)</td>
<td>155 (46.8)</td>
<td>0.2</td>
<td>1.5 (0.8-3)</td>
</tr>
</tbody>
</table>

OR: odds ratio. IDU: intravenous drugs user

Of the sample studied, 40 (10.8%; CI: 7.5-14) were HIV infected, 84 (22.7%) with Hepatitis C, 9 (2.6%) with Hepatitis B (HbsAg +) and 173 (50.5%) with M. tuberculosis.
The profile of those infected by HIV corresponds to a young patient (average 39.2 years), male (95%), Spanish (90%), Caucasian (87.5%) with a background of IDU (85%), with a known HIV infection time of 8 years (DS+/- 5.2) and a prison stay of 7.7 years (DS +/− 6.8). 85% of those infected by HIV were co-infected with hepatitis C, 12.5% conjointly with hepatitis B and C, and 63.2% with M. tuberculosis, which represents a proportion of the overall prison population of 9.2%, 1.3% and 6.7% respectively (figure 1). The median of CD4 lymphocytes was 473/mm³ (+/− 6.8). 85% of those infected by HIV were co-infected with hepatitis C, 12.5% conjointly with hepatitis B and C, and 63.2% with M. tuberculosis, which represents a proportion of the overall prison population of 9.2%, 1.3% and 6.7% respectively (figure 1). The median of CD4 lymphocytes was 473/mm³ (+/− 6.8). 85% of those infected by HIV were co-infected with hepatitis C, 12.5% conjointly with hepatitis B and C, and 63.2% with M. tuberculosis, which represents a proportion of the overall prison population of 9.2%, 1.3% and 6.7% respectively (figure 1). The median of CD4 lymphocytes was 473/mm³ (+/− 6.8). 85% of those infected by HIV were co-infected with hepatitis C, 12.5% conjointly with hepatitis B and C, and 63.2% with M. tuberculosis, which represents a proportion of the overall prison population of 9.2%, 1.3% and 6.7% respectively (figure 1). The median of CD4 lymphocytes was 473/mm³ (+/− 6.8). 85% of those infected by HIV were co-infected with hepatitis C, 12.5% conjointly with hepatitis B and C, and 63.2% with M. tuberculosis, which represents a proportion of the overall prison population of 9.2%, 1.3% and 6.7% respectively (figure 1). The median of CD4 lymphocytes was 473/mm³ (+/− 6.8). 85% of those infected by HIV were co-infected with hepatitis C, 12.5% conjointly with hepatitis B and C, and 63.2% with M. tuberculosis, which represents a proportion of the overall prison population of 9.2%, 1.3% and 6.7% respectively (figure 1). The median of CD4 lymphocytes was 473/mm³ (+/− 6.8). 85% of those infected by HIV were co-infected with hepatitis C, 12.5% conjointly with hepatitis B and C, and 63.2% with M. tuberculosis, which represents a proportion of the overall prison population of 9.2%, 1.3% and 6.7% respectively (figure 1). The median of CD4 lymphocytes was 473/mm³ (+/− 6.8). 85% of those infected by HIV were co-infected with hepatitis C, 12.5% conjointly with hepatitis B and C, and 63.2% with M. tuberculosis, which represents a proportion of the overall prison population of 9.2%, 1.3% and 6.7% respectively (figure 1). The median of CD4 lymphocytes was 473/mm³ (+/− 6.8). 85% of those infected by HIV were co-infected with hepatitis C, 12.5% conjointly with hepatitis B and C, and 63.2% with M. tuberculosis, which represents a proportion of the overall prison population of 9.2%, 1.3% and 6.7% respectively (figure 1). The median of CD4 lymphocytes was 473/mm³ (+/− 6.8). 85% of those infected by HIV were co-infected with hepatitis C, 12.5% conjointly with hepatitis B and C, and 63.2% with M. tuberculosis, which represents a proportion of the overall prison population of 9.2%, 1.3% and 6.7% respectively (figure 1). The median of CD4 lymphocytes was 473/mm³ (+/− 6.8). 85% of those infected by HIV were co-infected with hepatitis C, 12.5% conjointly with hepatitis B and C, and 63.2% with M. tuberculosis, which represents a proportion of the overall prison population of 9.2%, 1.3% and 6.7% respectively (figure 1). The median of CD4 lymphocytes was 473/mm³ (+/− 6.8). 85% of those infected by HIV were co-infected with hepatitis C, 12.5% conjointly with hepatitis B and C, and 63.2% with M. tuberculosis, which represents a proportion of the overall prison population of 9.2%, 1.3% and 6.7% respectively (figure 1). The median of CD4 lymphocytes was 473/mm³ (+/− 6.8). 85% of those infected by HIV were co-infected with hepatitis C, 12.5% conjointly with hepatitis B and C, and 63.2% with M. tuberculosis, which represents a proportion of the overall prison population of 9.2%, 1.3% and 6.7% respectively (figure 1).

The bivariate analysis associated being HIV infected (table 2) with: a) being older (39.2 vs. 35.4 years amongst the uninfected; p=0.002); b) more time in prison (7.7 vs. 3.1 years amongst the uninfected; p<0.001); c) not being Arabic 0% of infected patients vs. 16.3% amongst uninfected individuals; p=0.006); d) being Spanish (90% of infected patients vs. 57.1% of uninfected individuals; p=0.001); and being an IDU (85% vs. 16.1% amongst uninfected individuals; p<0.001). Multivariate analysis (table 3) confirmed the association with: a) being ≥ 40 years [OR= 2.66 (CI: 1.16-6.07) p=0.02]; b) being an IDU [OR= 28.08 (CI: 9.61-81.99) p<0.001]; being HCV infected [OR= 6.96 (CI: 1.90-25.39)]; and d) being infected by HBV [OR= 13.52 (CI: 1.76-103.82)].

<table>
<thead>
<tr>
<th>Variables</th>
<th>Value “p”</th>
<th>OR (IC 95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ≥ 40 years</td>
<td>0.02</td>
<td>2.66 (1.16-6.07)</td>
</tr>
<tr>
<td>Years in prison≥ 5</td>
<td>0.7</td>
<td>1.15 (0.49-2.71)</td>
</tr>
<tr>
<td>Spanish</td>
<td>0.8</td>
<td>1.16 (0.32-4.20)</td>
</tr>
<tr>
<td>IDU</td>
<td>&lt;0.001</td>
<td>28.08 (9.61-81.99)</td>
</tr>
<tr>
<td>HCV infection</td>
<td>0.003</td>
<td>6.96 (1.90-25.39)</td>
</tr>
<tr>
<td>HBV infection</td>
<td>0.01</td>
<td>13.52 (1.76-103.82)</td>
</tr>
</tbody>
</table>

Table 3. Variables associated with HIV infection (multivariate analysis)

**DISCUSSION**

The main limitation of this study is the one that is often attributed to prevalence studies. They give a static view of the problem, they are circumscribed to the time when the information is collected. However, the phenomenon is a dynamic one and for this reason regular studies to detect changing trends early are recommended. In reality, the prevalence of HIV infection amongst prisoners in Spain in the last 20 years has gone down from 40% to 10.8% observed in this study with progressive reductions in this time period. There have also been sizeable reductions of prevalence amongst prisoners in Italy and the USA. Despite the spectacular drop, the rate of HIV infection amongst inmates in Spain is still much higher than that of other developed countries such as Canada, Australia, the USA, and the EU in general. 1% amongst non-consumers and 4% amongst drug consumers or countries within the EU such as Spain, Portugal, Greece, Italy, and Great Britain. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovenia or Croatia and even exceeds that of some developing countries such as Indonesia, Lebanon, Pakistan, Morocco, Afghanistan, Greece, Italy, and Great Britain. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovenia or Croatia and even exceeds that of some developing countries such as Indonesia, Lebanon, Pakistan, Morocco, Afghanistan, Greece, Italy, and Great Britain. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovenia or Croatia and even exceeds that of some developing countries such as Indonesia, Lebanon, Pakistan, Morocco, Afghanistan, Greece, Italy, and Great Britain. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovenia or Croatia and even exceeds that of some developing countries such as Indonesia, Lebanon, Pakistan, Morocco, Afghanistan, Greece, Italy, and Great Britain. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovenia or Croatia and even exceeds that of some developing countries such as Indonesia, Lebanon, Pakistan, Morocco, Afghanistan, Greece, Italy, and Great Britain. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovenia or Croatia and even exceeds that of some developing countries such as Indonesia, Lebanon, Pakistan, Morocco, Afghanistan, Greece, Italy, and Great Britain. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovenia or Croatia and even exceeds that of some developing countries such as Indonesia, Lebanon, Pakistan, Morocco, Afghanistan, Greece, Italy, and Great Britain. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovenia or Croatia and even exceeds that of some developing countries such as Indonesia, Lebanon, Pakistan, Morocco, Afghanistan, Greece, Italy, and Great Britain. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovenia or Croatia and even exceeds that of some developing countries such as Indonesia, Lebanon, Pakistan, Morocco, Afghanistan, Greece, Italy, and Great Britain. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovenia or Croatia and even exceeds that of some developing countries such as Indonesia, Lebanon, Pakistan, Morocco, Afghanistan, Greece, Italy, and Great Britain. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovenia or Croatia and even exceeds that of some developing countries such as Indonesia, Lebanon, Pakistan, Morocco, Afghanistan, Greece, Italy, and Great Britain. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovenia or Croatia and even exceeds that of some developing countries such as Indonesia, Lebanon, Pakistan, Morocco, Afghanistan, Greece, Italy, and Great Britain. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovenia or Croatia and even exceeds that of some developing countries such as Indonesia, Lebanon, Pakistan, Morocco, Afghanistan, Greece, Italy, and Great Britain.
up to 8 years beforehand, but it is likely that a significant percentage were infected years before finding out. As mentioned previously, this data would suggest that there is an ever smaller inclusion of young people into injected drug abuse and that infection in the IDU group has gone down considerably5,6.

What is noteworthy is that 85% were co-infected with Hepatitis C and 12% with Hepatitis B and C, as these viruses are efficiently transmitted intravenously. Given the age of the people affected, and the IDU time period, it is likely that many acquired these infections some time ago and so an increase in hepatic diseases is to be expected in these cases over the next few years60. The maintenance of damage reduction programs is therefore advisable, including syringe exchange programs, which are increasingly applied in Spain61 and other countries 62,63 to reduce the intravenous transmission of HIV, HCV and HBV amongst inmates that consume drugs, as well as guaranteeing treatment of hepatitis C without unnecessary delays for patients that require it.

The observed high rates (50.8%) of people infected by *M tuberculosis* and co-infection by HIV/*M tuberculosis* should also be mentioned; the latter has gone down from the 20.1% observed in a previous study64 to the present 6.7%, but still continues to be extremely high.

Prisons could play an important role –epidemiological, economic, clinical and therapeutic– via the identification of individuals infected with HIV who have not been diagnosed. It is calculated that this group in the EU could represent 30%65 of all those infected. The recommendations of the European Centre for Disease Control (ECDC) consider Prison Health as an essential part of the national programs directed towards extending the HIV test and reducing late diagnosis. In Spanish prisons the HIV blood test has been freely, voluntarily and confidentially offered to all inmates since the end of the eighties. It makes sense therefore to not lower our guard and continue to recommend a complete study of all inmates, with special emphasis on those over 40, IDUs and those infected by HBV and/or HCV as the groups most vulnerable to acquisition of HIV amongst prison inmates.

**BIBLIOGRAPHICAL REFERENCES**


44. Strazza LO, Massad EE, Azevedo RS, Carvalho HB. Behavior associated with HIV and HCV infection in female prison inmates in São Paulo, Brazil. Cad Saude Publica. 2007; 23: 197-205.


