

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

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## 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  $\alpha$  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%  $\leq$  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)  $\geq 40$  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.

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## INTRODUCTION

In Spain there are approximately 130,000 people infected with HIV<sup>1</sup>, 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 2010<sup>2</sup>. In 2009, 2,264 new cases of infection were diagnosed, which means a rate of 79.3/million

inhabitants<sup>3</sup>, 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 Union<sup>4</sup>.

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

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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<sup>5,6</sup>, 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<sup>7</sup>, which has presented important sociological changes in recent years: a modification of consumption patterns amongst Spanish substance abusers<sup>8,9</sup>, with lesser use of intravenous methods and an increase in foreign prisoners, who are generally less given to IDU<sup>10</sup>. 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, Teixeira (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%  $\leq$  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.

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

IDU: Intravenous drug user

Table 1. Descriptive characteristics of the studied sample.

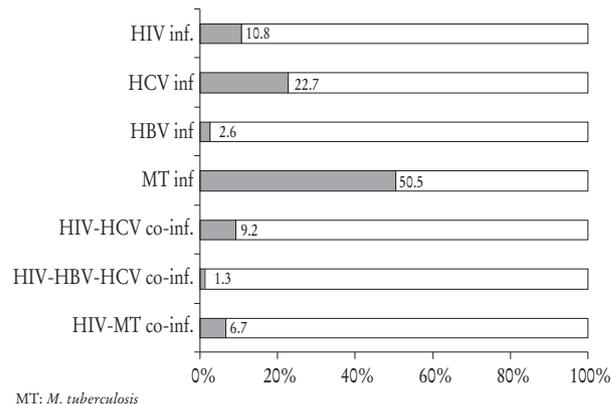


Figure 1. Proportion of people infected by HIV, HBV HCV and M tuberculosis, as well as co-infected by HIV with HBV, HCV and M tuberculosis in the prison population of Spain.

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*.

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

OR: odds ratio. IDU: intravenous drugs user

Table 2 Variables associated with HIV infection (bivariate analysis)

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/mm<sup>3</sup> (+/- 254) and 10.3% complied with diagnostic criteria for AIDS (status C3 of the CDC).

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)].

• Variables	Value "p"	OR (IC 95%)
• Age ≥ 40 years	0.02	2.66 (1.16-6.07)
• Years in prison ≥ 5	0.7	1.15 (0.49-2.71)
• Spanish	0.8	1.16 (0.32-4.20)
• IDU	<0.001	28.08 (9.61-81.99)
• HCV infection	0.003	6.96 (1.90-25.39)
• HBV infection	0.01	13.52 (1.76-103.82)

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 rec-

ommended. In reality, the prevalence of HIV infection amongst prisoners in Spain in the last 20 years has gone down from 40%<sup>11</sup> to the 10.8% observed in this study with progressive reductions in this time period<sup>12-14</sup>. There have also been sizeable reductions of prevalence amongst prisoners in Italy<sup>15</sup> and the USA<sup>16</sup>. 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 (0.9-2-3%)<sup>17,18</sup>, Australia (<1%)<sup>19</sup>, the USA (0.3%-8.5%)<sup>20,21</sup>, the EU in general (1% amongst non-consumers and 4% amongst drug consumers)<sup>22</sup> or countries within the EU such as Finland (0.7%-1%)<sup>23</sup>, Portugal (6%)<sup>24</sup>, Greece (1%)<sup>25</sup>, Italy (7.5%)<sup>26</sup>, Ireland (<2%)<sup>27</sup>, Denmark (0%)<sup>28</sup> or Great Britain (1.7%-4-5%)<sup>29,30</sup>. The prevalence of HIV infection amongst prisoners in Spain is also higher than that of non-EU member states such as Slovakia (0%)<sup>31</sup> or Croatia (0.15%)<sup>32</sup> and even exceeds that of some developing countries such as Indonesia (7.2%)<sup>33</sup>, Lebanon (0.17%)<sup>34</sup>, Pakistan (<2%)<sup>35</sup>, Morocco (2%)<sup>36</sup>, Afghanistan (1.8%)<sup>37</sup>, Belize (4%)<sup>38</sup> or India (<2%)<sup>39</sup>. A similar or higher prevalence than the one mentioned in Spain is only observed in countries when one or more of the following circumstances arise: a) when prisons receive a high proportion of IDU inmates, as is the case in Spain. This occurs in some prisons in Russia<sup>40</sup>, Italy<sup>41</sup>, France<sup>42</sup>, Thailand<sup>43</sup> and Brazil<sup>44</sup>; b) when the population presents a high incidence of sexually transmitted diseases, as is the case with some Brazilian prisons with a large percentage of women who worked in prostitution<sup>44,45</sup>; and c) when the prison is in a country in the sub-Saharan region of Africa, such as Nigeria<sup>46</sup>, Ghana<sup>47</sup>, Malawi<sup>48</sup> or Zambia<sup>49</sup>, which have high rates of HIV infection amongst the general population. As an example of this last situation, the study by Adjei et al<sup>50</sup> is worth mentioning, where the prevalence of HIV, HCV and syphilis amongst prison staff was 4.9%, 18.7% and 7.9% respectively.

With the exception of prison inmates in developing countries, where there is a greater representation of patients infected by sexual transmission, in developed countries most infected patients are, or have been IDUs. Total abstinence for these patients is infrequent, even in prison. This explains why many studies refer to consumption in prison<sup>30,43,51-55</sup>, with up to 60% of users consuming there<sup>53</sup>, and seroconversions in the same locations<sup>54-59</sup>. In our study, 90% of the infected patients were Spanish—more consumers than amongst foreign inmates<sup>9</sup>—, 85% were IDUs and only 16% of those that had at some time been IDUs had not acquired the infection. What is more, the majority were over 40 years of age and were aware of being infected

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 considerably<sup>5,6</sup>.

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 years<sup>60</sup>. The maintenance of damage reduction programs is therefore advisable, including syringe exchange programs, which are increasingly applied in Spain<sup>61</sup> and other countries<sup>62,63</sup> 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 study<sup>64</sup> 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%<sup>65</sup> 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.

## CORRESPONDENCE

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