

## Occurrence and correlates of HIV and hepatitis B/C virus infections among prisoners of Southern Lazio, Italy

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### Abstract

**Background.** The aim of the study was to determine prevalence of HIV, HCV and HBV among the prisoners of the jails of Southern Latium (Italy).

**Methods. Design:** Cross-sectional study. **Participants and Setting:** Clinical charts of 2653 prisoners, of whom 940 were of the jail of Cassino, 1581 of the jail of Frosinone and 132 of that of Latina, since 1995 to 1999, were reviewed. **Measurement:** number of people tested for HIV, HCV and HBV infection and prevalence of diagnosed HIV, HCV and HBV infections.

**Results.** HCV was the most prevalent infection (28.2 %); HBV showed a lower prevalence (26%). Finally, 5.4% of inmates were infected by HIV. Multivariate regression analysis indicated drug addiction, civil status, smoking habit, age (age group 25-34 and 35-44, in respect with people aged 18-24) and Italian nationality as factors mainly associated to HBV, HCV and HIV infection. In particular we found HIV infection associated with the status of drug addiction (OR = 15.8), civil status (OR = 12.6 for widowers; and OR = 2.44 for cohabitants), smoking habits (OR = 3.09) and Italian nationality (OR = 5.39). Similar risk estimates were found for HCV and HBV.

**Conclusion.** High prevalence of blood transmitted infections in jails suggests that diagnostic and preventive measures, as hepatitis B vaccination, but also information and education programs for inmates, are needed to reduce the spreading of such infections, particularly HIV and HCV.

*Key words: HIV, HBV, HCV, prisoners, injecting drug use - Italy*

### Introduction

The penitentiaries can represent places where presence and diffusion of infections from HIV[1-10] and from liver viruses[11-19] could be high. Different researchers have discovered a certain number of behaviours at risk during the permanence within the jails as well as unprotected sexual relations, common use of hypodermic needles for execution of tattoos or exchange of syringes.[20-26]

Scientific literature points out a strong connection between infection from HIV, HBV, HCV and the group of drug-addicts in which some risk factors are surely present.[27-28] On the basis of many studies it is clear that although the jail can reduce the consumers of drugs by parenteral mean, the risk to contract the infections from HIV, HBV, and HCV would increase for people who continue to inject toxic substances.[29-30]

Other studies found the drug addiction might have started really inside the prison structure.[11,31]

Considering the spread of HIV/AIDS phenomenon and viral hepatitis in the

penitentiaries, two basic needs of protection come out: a) from one side the right to the health of the prisoner; b) on the other side the observance of precautionary needs of defence and social prevention.

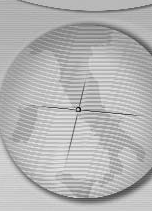
In relation to the first factor, in Italy recent modifications of disposals on execution of punishment, safety and preventive measures towards people suffering from HIV/AIDS has happened.[32,33] On the other side the modifications of penitentiary health system has the aim of rationalising the health interventions for prisoners (preventive, curative and rehabilitative), which are guaranteed by Constitution for the health service.[34]

The aim of this investigation was to evaluate the prevalence of HIV and hepatitis B/C virus infections and risk factors associated among prisoners of Southern Latium (Italy).

### Methods

#### Study design and setting

In order to evaluate the prevalence of HIV and hepatitis B/C virus infection among the prisoners



a cross-sectional study was initiated in the jails of Southern Latium (Cassino, Frosinone and Latina). The study has been authorized by the Ministry of Justice upon presentation of a detailed research protocol, in which the importance of the problems concerning the research had been pointed out. A pilot study of 1 month was conducted in December 2000, in order to validate the registration procedures and form. The definite cross-sectional study covered a period of 24 months (January 2001 - December 2002) considering all the prisoners hosted in the above mentioned jails during the years 1995-1999.

### Data collection

The clinical charts of the prisoners have been carefully examined by a public health doctor and by two social workers and the information relating to social demographic and health status data have been extracted from the above files. Particularly, information regarding seropositivity against HIV, HCV and HBV (anti-HBc positivity) were found in the charts. Diagnosis of the above seropositivities was made using ELISA method.

The respect of the prisoners privacy has been possible avoiding to register name and surname. All the pertinent data have been transferred on a special prepared form and afterwards introduced into a database.

### Statistical analysis

We composed frequency tables in order to describe the distribution of infections among inmates by several characteristics. The  $\chi^2$  test was used in order to find statistically significant differences between groups.

A stepwise logistic regression analysis was conducted (backward elimination), following the procedure described by Hosmer and Lemeshow,[35] using as dependent variables HIV, HBV and HCV seropositivity. The following variables were considered as covariates: nationality, civil status, age, educational level, number of previous detentions, drug addiction, use of methadone, presence of Syphilis antibodies (VDRL), previous sexually transmitted diseases, Tine test, alcohol abuse and smoking status. The  $p < 0.05$  level was used to determine statistical significance. Data processing, non parametric tests of significance, and logistic regression analysis were performed with SPSS statistical software.

### Results

The investigation has found the information relating to 2653 prisoners of male sex, distributed

as follows: 940 in Cassino, 1581 in Frosinone and 132 in Latina.

The socio-demographic characteristics of the prisoners are shown in Table 1. Altogether in the periods taken into consideration 1828 prisoners (68.9%) were Italian and 825 (31.1%) of foreign nationality. Most of them (52.7%) had never married, 38.9% were currently married or cohabitant and 8.5% were separated or widowed. The majority of inmates (46.3%) had junior high school education. Only 1.2% had educational level higher than secondary school. As far as the number of detentions is concerned, it was the first episode for 2005 men (78.7%), while for 543 persons (21.3%) at least another previous experience of detention has been occurred. Relating to 105 prisoners the information about the number of detentions was not available.

In Table 2 status of drug addiction relating to the type of jails is pointed out, considering that this information was not available for 67 prisoners.

It is possible to observe that out of 2586 prisoners, 955 (36.9%) appeared drug addicts at the moment of entry in the jail and 89 (3.4%) former addicts.

The range of drug addiction beginning goes from 9 to 44 years, with a mean age of 19 for the drug addicts and 18 for the former drug addicts.

Considering the type of drug used 817 individuals (85.5%) were heroin dependents, 517 (54.1%) cocaine addicts and 265 (27.7%) were multi-drugs consumers. Furthermore among drug addicts 329 individuals (34.5%) were methadone consumers.

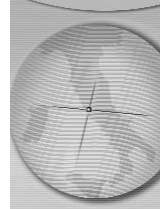
In relation to HIV, HBV and HCV infections, we found information on correspondent tests in the clinical chart from 1214 (45.7%), 1116 (42.1%) and 1091 (41.1%) prisoners, respectively.

HIV positive infection has been discovered in 65 individuals (5.4% of tested prisoners), with statistically different percentages among the jails: 18 in Cassino (3%), 45 in Frosinone (8.1%) and 2 in Latina (3.3%) ( $p < 0.001$ ).

Among the 65 inmates HIV, 61 (61/65) were of Italian nationality, 30 (30/65) reported previous imprisonment, 59 (59/65) individuals appeared heroin dependents and 54 (54/65) were smokers.

Prisoners' health characteristics with reference to the status of HIV, HCV and HBV infections are showed in Table 3. It is important to remark that in many cases it was not possible to obtain data about HIV positive infection because the screening analyses have not been executed.

Multiple logistic regression was used to identify significant factors associated with seropositivity against antibodies of the three viruses studied. The


**Table 1. Demographic characteristics of prisoners, according to seropositivity against HIV, HCV and HBV.**

Characteristic	Total (%)		HIV + (%) 1214 prisoners		HCV + (%) 1170 prisoners		HBV + (%) 1191 prisoners	
<b>Jail (2653)</b>								
Cassino	940	(35.4)	18	(3)	101	(19.5)	100	(19.3)
Frosinone	1581	(59.6)	45	(8.1)	190	(36.5)	172	(31.9)
Latina	132	(5.0)	2	(3.3)	17	(12.9)	18	(13.6)
Total	2653	(100)	65	(5.4)	308	(28.2)	290	(26)
<b>Nationality (2653)</b>								
Italian	1828	(68.9)	61	(6.8)	271	(31.3)	242	(27.8)
Foreign	825	(31.1)	4	(1.2)	37	(12.2)	48	(15)
<b>Civil status (2085)</b>								
Single	1098	(52.7)	26	(5.3)	149	(30.8)	133	(26.9)
Married	662	(31.8)	5	(1.8)	43	(15.3)	61	(21.0)
Cohabitant	147	(7.1)	13	(16.5)	34	(43.6)	19	(24.4)
Separated	157	(7.5)	7	(8.3)	28	(36.4)	27	(35.1)
Widower	21	(1.0)	3	(17.6)	6	(42.9)	6	(40.0)
<b>Age group</b>								
18-24	651	(24.5)	2	(0.8)	42	(17.5)	36	(14.8)
25-34	1105	(41.7)	34	(6.3)	179	(34.1)	150	(28.4)
35-44	549	(20.7)	25	(9.0)	77	(29.2)	79	(29.3)
≥45	258	(9.7)	1	(0.9)	3	(2.9)	18	(16.7)
not reported	90	(3.4)	3	(3.3)	1	(6.3)	3	(17.6)
<b>Educational level (1741)</b>								
Illiterate	64	(3.7)	0	(0)	4	(12.1)	6	(16.7)
Elementary school	665	(38.2)	18	(5.1)	90	(26.2)	95	(26.8)
Junior high school	806	(46.3)	21	(5.4)	129	(32.3)	109	(26.9)
Senior high school	185	(10.6)	3	(3.9)	16	(21.3)	14	(18.9)
Degree	21	(1.2)	0	(0)	2	(20)	0	(0)
<b>Number of detentions (2548)</b>								
First detention	2005	(78.7)	33	(4.2)	180	(23.7)	179	(23.6)
More than 1 detention	543	(21.3)	30	(8.3)	115	(33)	95	(25.9)

results of our analysis are presented for HIV, HBV and HCV (Table 4). It is possible to observe status of drug addicts (OR=15.81), civil status (OR=12.58 for widowers and OR=2.43 for cohabitants; respectively  $p=0.003$  and  $p<0.001$ ), smoking of tobacco (OR=3.09;  $p<0.05$ ), Italian nationality (OR=5.39;  $p<0.05$ ) and age group are factors significantly associated to HIV infection.

As far as HBV infection is concerned, out of

1116 individuals antibodies to hepatitis B has been discovered in 290 (26%) prisoners. Out of 1116 inmates with anti-HBc positivity, 185 (16.6%) were found positive to HBsAg, and 73 (6.5%) positive to HBeAg. It should be noted as variables associated to HBV seropositivity are the status of drug addiction (OR=5.87;  $p<0.001$ ), smoking of tobacco (OR=1.35;  $p=0.021$ ), Italian nationality (OR=2.07;  $p=0.009$ ), age group and civil status

**Table 2. Status of drug addiction.**

Jail	Not addiction (%)		Addiction (%)		Former addiction (%)	
Cassino	517	(56.5)	371	(40.5)	27	(3.0)
Frosinone	945	(61.4)	533	(34.6)	61	(4.0)
Latina	80	(60.6)	51	(38.6)	1	(0.8)
Total	542	(59.6)	955	(36.9)	89	(3.4)

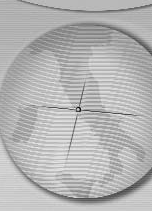


Table 3. Health status characteristics, according to seropositivity against HIV, HBV and HCV.

Characteristic	Total (%)	HIV + (%) 1214 prisoners	HCV + (%) 1170 prisoners	HBV + (%) 1191 prisoners
<b>Drug addiction (2653)</b>				
No	1608 (60.6)	4 (0.7)	35 (6.1)	72 (12.1)
Yes	956 (36.0)	57 (10.1)	246 (45.6)	201 (37.1)
Former	89 (3.4)	4 (6.8)	27 (50.9)	17 (32.7)
<b>Drug type</b>				
Heroin	817 (30.8)	59 (11.7)	262 (54.5)	197 (41.6)
Cocaine	516 (19.4)	28 (8.9)	145 (48.5)	117 (39)
<b>Use of methadone (956)</b>				
No	497 (52)	0	4 (4.1)	4 (4.2)
Yes	459 (48)	44 (15.1)	160 (57.6)	121 (44.2)
<b>VDRL (1465)</b>				
Positive	22 (1.5)	3 (15.0)	5 (35.7)	7 (36.8)
Negative	1443 (98.5)	49 (4.5)	249 (25.2)	246 (24.3)
<b>Previous sexually transmitted diseases (2345)</b>				
Yes	45 (1.9)	4 (11.1)	11 (34.4)	13 (34.2)
No	2300 (98.1)	47 (4.5)	264 (26.2)	251 (24.5)
<b>Tine test (1385)</b>				
Positive	63 (4.5)	2 (4.9)	12 (29.3)	15 (34.9)
Negative	1322 (95.5)	46 (4.9)	13 (25.6)	205 (23.0)
<b>Alcohol abuse (2520)</b>				
Yes	192 (7.6)	9 (7.4)	29 (27.6)	29 (26.4)
No	2328 (92.4)	55 (5.2)	270 (26)	252 (23.9)
<b>Smoking status (2532)</b>				
Yes	1612 (63.7)	54 (6.5)	250 (31.0)	220 (27.0)
No	920 (36.3)	10 (2.8)	51 (14.7)	62 (17.3)

(being cohabitant appears to be a protective factor).

Finally, regarding HCV, seropositive inmates were 308 (on 1091), equal to 28.2 % of prisoners. Independent significant factors associated to HCV infection were the status of drug addiction (OR=11.64; p<0.001), smoking of tobacco (OR=1.83; p=0.007), Italian nationality (OR=2.93; p<0.01) civil status (being married appears to be a protective factor).

### Discussion

This cross-sectional study carried out in the jails in Southern Lazio has shown a prevalence of HBV seropositivity of 26%. HCV seropositivity was found in 28.2% of inmates, and HIV+ in 5.4%. Data regarding HIV, HCV and HBV prevalence, even if remarkable, could however represent a biased

estimation of the phenomenon, as screening about these infections are not mandatory for all prisoners. In our study the prisoners really subject to HIV test were the 47.37% of the total of prisoners. This particular situation could be due to the fact that all the examined penitentiaries in our study are gaols where the prisoners are confined waiting the judgement or condemned to punishments lower than 5 years.

Anyway it appears in a complete significant way that HIV, HBV and HCV seropositivities are strictly associated to the status of drug addiction, especially intravenous heroin addiction. Particularly, the exchange of syringes appears as the decisive factor about spread of infections from HIV and liver viruses, confirming in this way the results of similar national[36] and international investigations.[2,3,7,12,23,24,26,28,30,31]

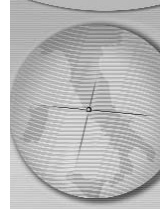


Table 4. Factors associated with HIV, HBV and HCV infections among inmates.

Characteristic	HIV + OR (95%CI)	HCV + OR (95%CI)	HBV + OR (95%CI)
<b>Drug addiction</b>			
No (reference group)	1	1	1
Yes	15.81 (3.64 - 68.66)**	11.64 (7.13 - 19.02)**	5.87 (3.94 - 8.75)**
<b>Age group (years)</b>			
18-24 (reference group)	1	1	1
25-34	6.33 (1.46 - 27.57)*	3.26 (2.04 - 5.21)**	2.18 (1.35 - 3.51)**
35-44	9.30 (2.05 - 42.25)**	3.08 (1.78 - 5.32)**	2.81 (1.65 - 4.80)**
≥45	2.91 (0.25 - 34.51) ns	0.31 (0.09 - 1.09) ns	1.64 (0.84 - 3.22) ns
<b>Smoking status</b>			
No. (reference group)	1	1	1
Yes	3.09 (1.02 - 10.07)*	1.83 (1.12 - 3.01)*	1.35 (1.01 - 2.07)*
<b>Nationality</b>			
Foreign (reference group)	1	1	1
Italian	5.39 (1.26 - 23.04)*	2.93 (1.78 - 4.83)**	2.07 (1.30 - 3.29)**
<b>Civil Status</b>			
Single (reference group)	1	1	1
Cohabitant	2.44 (1.05 - 5.68)*	1.07 (0.61 - 1.89) ns	0.46 (0.24 - 0.89)**
Widower	12.58 (2.10 - 75.45)**	5.90 (1.24 - 27.99)*	3.41 (1.03 - 11.32)**
Married	0.35 (0.12 - 0.99)*	0.55 (0.33 - 0.90)*	0.95 (0.65 - 1.39) ns
Divorced	0.89 (0.35 - 2.25) ns	0.99 (0.53 - 1.84) ns	1.17 (0.68 - 2.02) ns
<b>Goodness of fit</b>			
	$\chi^2 = 77.621$ $p < 0.0001$	$\chi^2 = 264.917$ $p < 0.0001$	$\chi^2 = 124.997$ $p < 0.0001$
* < 0.05; ** < 0.01; ns = not significant			

Moreover, it is particularly important the influence of civil status on the HIV seropositivity, being the status of widower and cohabitant significantly associated with this infection.

It is interesting to note the high prevalence of smokers among the prisoners appears a factor associated to the HBV, HCV and HIV positivity and this condition seems to be associated once more to the high frequency of such habit among individuals who misuse of toxic substances and especially among the various drug consumers.

In our study it is meaningful that seroprevalence of antibodies to HBV among the prisoners shows a lower value with respect to HCV infection. This finding could be due to the HBV vaccination, compulsory in Italy since 1991, but we cannot support this explanation cause a lack of information about this type of vaccination in the clinical charts. Anyway in a near future, also in this population the risk of HBV infection would be reduced. Moreover, other factors could explain the lower HBV prevalence in this population, in

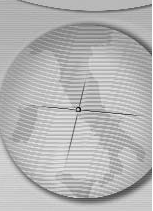
respect with HCV prevalence, such as efficiency of transmission by sexual way, percentage of subject that clear the virus, different HBV/HCV epidemiological patterns in recent years.

On the other hand, the lack of the vaccination against HCV places a serious problem in terms of prevention and public health. In this case the strategies of prevention consist in measures such as education about hepatitis risk factors.

Finally it is possible to state HBV, HCV and HIV sero-positivities in jails appears worrisome, even if paradoxically, HIV positive individuals find the opportunity to have a good treatment inside the prison environment.[37]

In the Italian reality HIV positivity at the moment of entrance into the jail doesn't appear too high, as verified in other environments.[36]

It is finally worrisome not all prisoners are submitted for screening and this could cause a risk source either for the warders or for the other prisoners, while in other countries mandatory drug and blood tests exist.[38]



Our study has some limitations. One weakness is information bias. The study was based on the information gathered in the clinical charts, that may not have been complete in defining inmates' investigation. Moreover, for some variables we did not find sufficient information (educational level, and partially, civil status). On the other hand, the chosen study design is a good tool for avoiding the influence of the research process on the daily clinical management of the prisoners.

Another weakness could have been selection bias, because it is possible that drug addicts were most likely given a HIV, HBV and HCV test, and in that case could arise an overestimation of the prevalence rates. In this case, if we hypothesize that all prisoners not given a test were seronegative, we would find a prevalence of 2.45%, 10.9% and 11.6%, respectively.

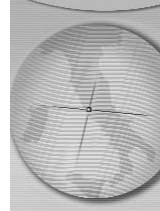
A fundamental role in the control of infection from HIV in prison environment may be found possibly through prevention. The way that seems more convenient to follow in fighting against AIDS problem also in the jail appears, waiting for a positive evolution of preparing a sure and immunological vaccine, the application of measures of direct and indirect prophylaxis, in environment of which a correct and systematic information about the prisoners and the warders has naturally taken on great importance.

The second fundamental aspect of the preventive strategy against HIV/AIDS in the prison environment is represented by a thorough observance of the hygienic rules either general or specific too often neglected also in their more elementary aspects.

The overcrowding of the jails and the consequent strong discomfort either among the warders or among the prisoners has become one of the most urgent problem to face and to solve [39], to avoid a negative conditioning in the struggle either against the acquired immunodeficiency syndrome or against other infectious and parasitical pathologies.

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