

BRIEF REPORT

## Prevalence and incidence of hepatitis B virus, hepatitis C virus and human immunodeficiency virus among personnel and patients of a psychiatric hospital

Vincenzo Di Nardo<sup>1</sup>, Nicola Petrosillo<sup>2</sup>, Giuseppe Ippolito<sup>2</sup>, Maria Elena Bonaventura<sup>1</sup>, Vincenzo Puro<sup>2</sup>, Bruno Chiaretti<sup>3</sup> & Mauro Tosoni<sup>1</sup>

<sup>1</sup>*Divisione di Malattie Infettive, ospedale di Rieti;* <sup>2</sup>*Centro Riferimento AIDS, ospedale L. Spallanzani, Rome;*

<sup>3</sup>*Laboratorio, ospedale di Amatrice, Rieti, Italy*

Accepted in revised form 15 November 1994

**Abstract.** In 1989 and 1992, HIV, HBV and HCV serosurveys were carried out among personnel and patients of an Italian Psychiatric Hospital. No HIV cases were found. Mean annual HBV seroconversion

rate was 0.99% in patients and 4.4% in personnel; HCV rate was 0.42% among patients. Although the nosocomial risk of bloodborne infection was low, efforts should be made to minimize it.

**Key words:** Health care workers, HBV, HCV, HIV, Psychiatric patients

Health care workers (HCWs) are at risk for occupational exposure to bloodborne infections caused by hepatitis B virus (HBV) [2, 14], hepatitis C virus (HCV) [1, 11] and human immunodeficiency virus (HIV) [10].

HBV has long been recognized as endemic in residential facilities for mentally handicapped persons [5, 7, 8, 15], but few data are available on HCV and HIV diffusion among such patients and staff who care for them. Moreover, most of the published data on HIV infection are referred to acute patients [12, 16, 20, 21], while, to our knowledge, no data are available on HIV diffusion among chronic psychiatric institutionalized patients.

The objective of this study was to evaluate the incidence of bloodborne virus infections in a cohort of relatively elderly static psychiatric institutionalized patients and the occupational risk of seroconversion among hospital staff.

In 1989, during the HBV vaccination campaign in Latium region, Central Italy [3], a seroprevalence survey of HBV markers (HBsAg, anti-HBs, anti-HBc), detected by a commercially available enzyme immunoassay (EIA), was carried out in the long-term Psychiatric Hospital of Rieti, Latium. All 206 patients and 145 HCWs (8 physicians, 108 nurses, 12 housekeepers, 3 technicians, 5 laundry workers and 9 'other' category) were tested. Subsequently residual sera were frozen (–20 °C) and stored.

During the next three years, there was no new entry of long-term psychiatric patients in the hospital, and no other HCWs were employed. Among the originally enrolled individuals, 30 patients and 2 HCWs were lost to follow-up because of death and

58 HCWs retired: no data are available on their HBV and HCV sero-status. Thus, in 1992, the 176 patients and 85 HCWs (2 physicians, 68 nurses, 7 housekeepers, 1 technician, 2 laundry workers and 5 'other' category) who were still at the hospital were tested for HBV and HCV markers. For HCV a commercially available second generation EIA assay was used; positive sera were confirmed using a second generation RIBA assay. At the same time, antibodies to HCV were determined on 1989 stored sera.

Staff answered a questionnaire that included information on gender, age, number of years in occupation, their category and needlestick injury in the past year. For patients data on gender, age and number of years of hospitalization were ascertained.

Finally, all sera collected both from patients and staff in 1989 and 1992 were tested anonymously and unlinkedly for anti-HIV antibodies by a commercially available EIA test and, if positive, confirmed by Western blot technique.

HBV infection (HBV+) was defined as the presence of any HBV markers in subjects who were never vaccinated against HBV or of HBsAg and/or anti-HBc in those who had been vaccinated.

The results were analyzed by Chi square statistics and, where appropriate, by Fishers' exact test; 95% confidence intervals (CI) were calculated.

In 1989, the numbers of HBV-positive and anti-HCV-positive patients were 97 (47.5%) and 22 (10.1%), respectively; there were 10 HBsAg carriers (4.8%). No significant differences were found in the distribution of prevalences by gender, age and length of hospitalization. For HBV, higher prevalences were found in males (69/135, 51.1%), in those 40–49 years

of age (25/41, 60.8%), and in those with more than 50 years in the hospital (7/11, 63.6%).

For HCV, higher prevalences were found in females (10/71, 14.1%), in those more than 60 years of age (15/100, 15%), and in those with more than 50 years in the hospital (2/11, 18.2%). Table 1 summarizes the HBV and HCV prevalence rates found among patients. No anti-HIV seropositive patients were detected in 1989.

**Table 1.** HBV and HCV prevalences according to age and length of institutionalization among chronic psychiatric patients of Rieti Psychiatric Hospital in 1989

	N	HBV+ N (%)	HCV+ N (%)
Age group (years)			
< 40	12	6 (50.0)	0
40-49	41	25 (61)	3 (7.3)
50-59	53	21 (39.6)	4 (7.5)
≥ 60	100	45 (45)	15 (15)
Length of institutionalization (years)			
< 20	19	9 (47.4)	2 (10.5)
20-29	62	28 (45.2)	4 (6.4)
30-39	76	37 (48.7)	10 (13.2)
40-49	38	16 (42.1)	4 (10.5)
≥ 50	11	7 (63.6)	2 (18.2)
Total	206	97 (47.1)	22 (10.7)

HBV+ = patients with any HBV marker.

HCV+ = patients with antibodies to HCV.

In 1992, among the 176 remaining patients, 67 who were HBV-negative (i.e., 27 not vaccinated and 40 vaccinated non-responders) and 158 who were anti-HCV-negative in 1989, were retested. There were 2 HBV seroconversions (anti-HBc positivity), both in patients who were non-responders to HBV vaccine, and 2 anti-HCV seroconversions. No seroconversion for HIV infection occurred. The 1992 HBV and HCV prevalences were 40.7% (84/176) and 11.3% (20/176), respectively. The mean annual rate of seroconversion among the susceptible subjects was 0.99% (95% CI: 0.11-3.54) for HBV, and 0.42% (95% CI: 0.05-1.5) for HCV. Patients who seroconverted for HBV and anti-HCV had no history of blood transfusions nor of intravenous drug abuse.

In 1989, there were 28 (19.3%) HCWs with any HBV marker and 2 (1.4%) with antibody to HCV; 4 (2.8%) were HBsAg carriers. No HCWs were found to be anti-HIV-positive. Higher HBV prevalences were found in males (17/80, 21.3%), in those with more than 39 years of age (22/105, 21%), and with more than 14 years of work in the hospital (17/82, 20.7%); however, these differences were not statistically significant. The two HCV subjects (1 male and 1 female) had more than 39 years of age, and 13 and 25 years of employment, respectively.

Table 2 summarizes the HBV and HCV prevalence rates observed in 1989 among HCWs.

Eighty-five out of 145 HCWs were still working in the hospital in 1992. Sixty-two of them underwent HBV vaccination in 1989. Among the 15 HCWs susceptible to HBV (6 not vaccinated and 9 vaccinated non-responders), there were 2 HBV seroconversions (anti-HBc positivity), one in each of the groups. The two seroconverters were both nurses. The mean HBV annual seroconversion rate was 4.4% (95% CI: 0-9.4). No seroconversion for HCV or HIV was found. The 1992 HBV and HCV prevalences were 22.3% (19/85) and 1.1% (1/85), respectively.

Forty-two (49.4%) HCWs recalled at least one needlestick injury in the past year; 18 of them 2-4 times and 9 more than 4 times. Among the 15 HBV-susceptible HCWs, 6 recalled a needlestick injury and 2 of them were found to be HBV-positive in 1992 versus 0/9 who did not recall a needlestick ( $p = 0.14$ , Fishers' exact test).

In our study, in 1989 the prevalence of HBV infection among the personnel of Rieti Psychiatric Hospital was low as compared to hospital workers of other specialities in Latium [2]. However, a higher HBV prevalence was found among those HCWs with a longer length of employment: the low numbers of the study population possibly did not permit to reach a statistical significance. Moreover, the 4.4% mean HBV annual seroconversion rate was not negligible compared to the 1.1% found by Petrosillo et al. [14] in Italian hospital workers, and was probably related to the high needlestick injury rate. Indeed, both the HBV seroconverters sustained a needlestick injury in the past year.

In our survey, anti-HCV prevalence in HCWs was similar to that found among Italian blood donors [19] and no cases of infection were documented in spite of the high rate of needlesticks and the 10% prevalence rate of anti-HCV-positive patients. This finding is consistent with the observed lower probability of

**Table 2.** HBV and HCV prevalences according to age and length of employment among hospital personnel of Rieti Psychiatric Hospital in 1989

	N	HBV+ N (%)	HCV+ N (%)
Age group (years)			
< 40	40	6 (15)	0
≥ 40	105	22 (21)	2 (1.9)
Length of employment (years)			
< 15	63	11 (17.4)	1 (1.6)
≥ 15	82	17 (20.7)	1 (1.2)
Total	145	28 (19.3)	2 (1.4)

HBV+ = health care workers with any HBV marker.

HCV+ = health care workers with antibodies to HCV.

transmission of HCV via occupational needlestick exposure [11] than for HBV [18], while HIV risk seems to be minimal [10].

The reports of HCV prevalence surveys in mental institutions are contrasting and probably mirror regional differences in infection rates. Chaudhary et al. [6] studied 264 mentally handicapped patients in a Canadian psychiatric facility; none of the residents were positive for anti-HCV while 91% were HBsAg or anti-HBs positive. On the contrary, in Belgium different anti-HCV prevalences (11.1% and 3.3%) were found among patients in two mental institutions for children [22].

Among 113 mentally handicapped outpatients with developmental disabilities at a center in suburban New York City, Levinson et al. found none to be anti-HCV positive [13]. Twenty-one percent of them showed serologic evidence of past HBV infection on the basis of HBcAb positivity and three (2.7%) were also HBsAg-positive. Among the 24 anti-HBc-positive patients, 17 (71%) had previously been institutionalized. In Italy, Guadagnino et al. studied 97 mentally handicapped institutionalized patients and 40 staff members and found an 8.2% and 7.5% anti-HCV prevalence in the two groups, respectively [9]. This was higher than the 1.8% rate found in healthy people living in the same geographical area.

In our study population, the 1989 HBV and HCV prevalences among institutionalized psychiatric patients were 47.1% and 10.7%, respectively. The lack of difference in the prevalences according to length of hospitalization could be explained by an early acquisition of infection in past decades ('cohort effect'): more than 20 years ago the conditions of promiscuity of mentally institutionalized patients were so critical as to induce the government to issue in 1978 a law that virtually eliminated the admission of patients to long-term psychiatric hospitals.

None of the new hepatitis B- and C-infected patients had a history of blood transfusion or intravenous drug abuse.

The difference in HBV and HCV prevalences and incidences among patients is probably consistent with the lower transmission rate of HCV. Moreover, HBV is likely transmitted also through inapparent routes and potentially infectious excreta as saliva (i.e., horizontal transmission), while the transmission of HCV seems to be more related to a parenteral route, even though some recent reports have shown the presence of HCV RNA also in saliva [23].

Several factors are associated with the high prevalence of HBV and HCV infections among mentally institutionalized patients found in 1989. Among them the conditions of promiscuity and sexual transmission could be likely in past decades, as suggested by other authors [17], and policies for sex education, instruction on the prevention of sexually transmitted diseases, and access to protective devices, including condoms, have been proposed for psychiatric

inpatients [17]. However, in our study no data are available on sexual behaviors of patients. Efforts, nonetheless, should be made to improve hygienic conditions among these subjects and to vaccinate all patients and HCWs against HBV. A campaign to implement Universal Precautions [4] and to educate HCWs to prevent sharp injuries in the hospital setting has been launched in this residential mental institution.

*Acknowledgements.* Work supported by Ministry of Health – ISS, AIDS projects – grant nr. 9201-04.

## References

1. Abb J. Prevalence of hepatitis C virus antibodies in hospital personnel. *Zentr Bakter* 1991; 274: 543–547.
2. Albertoni F, Di Nardo V, Ippolito G, et al. Regionwide survey of HBV markers in hospital workers in Latium, Italy. Presented at the 2nd International Conference of the Hospital Infection Society, London 1990; 132: P9/8.
3. Albertoni F, Ippolito G, Perucci CA, et al. Strategies of hepatitis B vaccination at regional level. In: Coursaget P, Tong MJ, eds, *Progress in Hepatitis B Immunization*. Colloque INSERM. London: John Libbey Eurotext. Vol 194, 1990; 429–436.
4. Centers for Disease Control. Universal Precautions for prevention of human immunodeficiency virus hepatitis B virus, and other bloodborne pathogens in health care settings. *MMWR* 1988; 37: 377–382, 387–388.
5. Chaudhary RK, Perry E, Cleary TE. Prevalence of hepatitis B infection among residents of an institution for the mentally retarded. *Am J Epidemiol* 1977; 105: 123–126.
6. Chaudhary RK, Perry E, Hicks F, Maclean C, Morbey M. Hepatitis B and C infection in an institution for the developmentally handicapped. *N Engl J Med* 1992; 327: 1953.
7. Devuyt O, Maesen-Collard Y. Hepatitis B in a Belgian institution for mentally retarded patients: an epidemiological study. *Acta Gastroenterol Belg* 1991; 54: 12–18.
8. Ellis CE, Erb LJ, Mckeown DJ, McFarlane GM. Hepatitis B control in Toronto classrooms for the mentally retarded: a seroprevalence survey. *Can J Public Health* 1990; 81: 156–160.
9. Guadagnino V, Foca A, Caroleo B, et al. Anti-HCV antibodies in institutionalized psychiatric patients. *Med Mal Infect* 1991; 21: 414–415.
10. Ippolito G, Puro V, De Carli G. The risk of occupational HIV infection in health care workers: Italian multicenter study. *Arch Intern Med* 1993; 153: 1451–1458.
11. Kiyosawa K, Sodeyama T, Tanaka E, et al. Hepatitis C in hospital employees with needlestick injuries. *Ann Intern Med* 1991; 115: 367–369.
12. Lee HK, Travin S, Bluestone H. HIV-1 in inpatients. *Hosp Community Psychiatry* 1992; 43: 181–182.
13. Levinson WM, Wormser GP, Forseter G, Calmann M, O'Brien TA. Hepatitis C virus seroprevalence in the

- developmentally disabled. *Arch Intern Med* 1992; 152: 2309-2311.
14. Petrosillo N, De Longis P, Antonelli L, et al. Incidence of hepatitis B infection in hospital personnel. In: Coursaget P, Tong MJ, eds, *Progress in Hepatitis B Immunization. Colloque INSERM*. London: John Libbey Eurotext. Vol 194. 1990; 267-268.
  15. Remis RS, Rossignol MA, Kane MA. Hepatitis B infection in a day school for mentally retarded students: transmission from students to staff. *Am J Public Health* 1987; 77: 1183-1186.
  16. Sacks M, Dermatis H, Looser-Ott S, Perry S. Seroprevalence of HIV and risk factors for AIDS in psychiatric inpatients. *Hosp Community Psychiatry* 1992; 43: 736-737.
  17. Satriano J, Courons F, Guido J, Kaplan M, Herman R, Horwath E. Psychiatric facilities and AIDS: and institutional response. Abstract X International Conference on AIDS, Berlin, Germany 1993; PO-D13-3753.
  18. Seef BL, Koff RS. Passive and active immunoprophylaxis of hepatitis B. *Gastroenterology* 1984; 86: 958-981.
  19. Sirchia G, Almini D, Bellobuono A, et al. Prevalence of hepatitis C virus antibodies in Italian blood donors. *Vox Sanguinis* 1990; 59: 26-29.
  20. Susser E, Valencia E, Conover S. Prevalence of HIV infection among psychiatric patients in a New York City men's shelter. *Am J Public Health* 1993; 83: 568-579.
  21. Volaka J, Convit A, O'Donnell J, et al. Assessment of risk behaviors for HIV infection among psychiatric inpatients. *Hosp Community Psychiatry* 1992; 43: 482-485.
  22. Vranckx R, Van Damme P. Hepatitis C in institutionalized children. *N Engl J Med* 1990; 323: 64.
  23. Wang J-T, Wang T-H, Lin J-T, Sheu J-C, Lin S-M, Chen D-S. Hepatitis C virus RNA in saliva of patients with post-transfusion hepatitis C infection. *Lancet* 1991; 337: 48.

*Address for correspondence:* Dr Giuseppe Ippolito, Centro Riferimento AIDS, Ospedale Lazzaro Spallanzani, Via Portuense 292, I-00149 Rome, Italy  
Phone: 39-6-5594223; Fax: 39-6-5594224