Risk for occupational transmission of HIV infection among health care workers
Study in a Spanish hospital

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Abstract. The aim of this study was to evaluate the HIV seroconversion rate associated with different types of occupational exposures in health care workers. A longitudinal study was conducted from January 1986 to October 1992 in a teaching hospital in Spain, where HIV infection is prevalent among patients. Each health care worker was asked to complete a questionnaire regarding age, sex, staff category, place of exposure, other exposures, type of exposure, body fluid, infected material and HIV status of source patient. These health care workers were then followed up at 6 weeks, 3 months, 6 months and 12 months with repeated test for HIV antibody. Four hundred twenty three reports of occupational exposure were analysed. Nursing was the profession with more exposures (42.8%). Ninety five percent of total exposures were percutaneous, 4% mucous-membrane contacts and 1% skin contacts, 88.3% were described as blood contact and 71.8% had resulted from needlestick and suture needles. Exposures from HIV-positive patients comprised 23.2% of occupational exposures. There was a significant difference in the length of follow-up in physicians ($p = 0.00009$) and nurses ($p = 0.00001$), when we compared HIV-positive patients with patients in whom the HIV status was unknown or negative. The HIV seroconversion rate was 0.00%. We consider that the risk of acquiring HIV infection via contact with a patient is low, but not zero. Well documented cases of seroconversion have been published. Because it is often impossible to know a patient's infection status, health care workers should follow for routine the universal precautions for all patients when there is a possibility of exposure to blood or other body fluid. Equally important is the development of new techniques to minimize the risk of exposures to blood.

Key words: Acquired immunodeficiency syndrome, Health care workers, Human immunodeficiency virus, Occupational seroconversion

Introduction

The number of human immunodeficiency virus (HIV) positive patients both known and unknown is increasing. About 5% of patients with AIDS and HIV infection in the United States have occurred in health-care workers. Although the majority of these infections has been related to lifestyle factors, the risk of infection through occupational exposure exists. The first report describing transmission of human immunodeficiency virus by needlestick injury has already been documented in a nurse in Great Britain in late 1984 [1]. As at 30 September 1992, the Centers for Disease Control (CDC) had already been reported 32 health-care workers in the United States with documented occupationally acquired HIV infection and another 69 with possible occupationally acquired HIV infection. The number of individuals with occupationally acquired HIV infection is probably higher than reported because not all health-care workers are evaluated for HIV infection following exposures and not all persons with occupationally acquired infection are reported [8].

There are several factors for determining the transmission of HIV: the chance that the patient is HIV infected, the type of exposure, the body fluid to which the health care workers is exposed, the quantity of virus present in body fluids, and the quantity of the infected material. In a patient with HIV infection, the plasma HIV titers may vary over the course of infection, even in the ‘window’ period before antibody becomes detectable but after exposure and infection with HIV, the culture may be positive [14]. The risk of seroconversion following needlestick exposures to blood from HIV-infected patients is less than 1%, and the risk associated with the exposure of nonintact skin or mucous membranes is even smaller [4]. ‘The health care workers who perform exposure-prone invasive procedures should known their HIV antibody status’ said the CDC [7]. Blood (or blood-contaminated fluid) is the body fluid most regularly containing high concentrations of
virus in infected individuals. Most of cases of occupationally acquired HIV have followed inoculation of small amounts of blood.

The risk of seroconversion following exposure to HIV-positive patients among health care workers has been the subject of this longitudinal study.

Material and methods

The survey was carried out in a 1,100 bed teaching hospital in Barcelona, from January 1986 to October 1992. We evaluated health care workers with a risk of possible exposure to HIV. Health care workers were defined as individuals, including students, whose activities involve contact with patients or body fluids from patients in a health care setting. The following criteria were used to define the serologic status of health care workers: seronegativity (when all tests obtained on or after the date exposure were negative for HIV antibody), seropositivity (if some test obtained on or after the date of exposure was positive for HIV antibody and was confirmed by Western blot) and seroconversion (when a health care worker who had been found seronegative for HIV antibody on the basis of a serum sample collected no more than 6 weeks after the date of exposure, was found seropositive on a specimen collected 90 days or more after the exposure).

Exposed workers should receive counseling and should be tested for HIV antibody before 48 hours after exposure at the Department of Preventive Medicine. Each health care worker was asked to complete a questionnaire regarding age, sex, staff category, place of exposure, other exposures (yes/no), type of exposure (percutaneous, mucous membrane exposure or skin contact), body fluid to which an individual is exposed (blood or others), infected material (needlestick or suture needles, abocaths, sharp objects, splash or others) and whether the source patient was known HIV-infected (HIV-positive or HIV-negative/unknown HIV status). We agree with CDC recommendations for follow-up HIV testing at 6 weeks, 3 months, 6 months and 1 year after exposure for documenting the presence or absence of infection.

The risk of seroconversion was calculated for each category (total number of seroconversions/total number of exposures), when the numerator of the risk was zero (that is, 0/N), the upper bounds of the 95% confidence intervals (CIs) were calculated using this formula: $1 - (0.05)^{1/N}$ [13]. The results were examined using the Chi-square test. A probability of < 0.05 was considered to be statistically significant. Values in tables and figures are expressed as a percentage of the total number of cases in the table.

Results

The survey indicated that a total of 423 exposures were observed in health care workers from January 1986 to October 1992 (Table 1). The study population were predominantly nurses (42.8%) and female (83.9%). The mean age was 35.3 (SD = 10.95).

### Table 1. Documented exposures by year

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986-1988</td>
<td>12 (1.9)</td>
</tr>
<tr>
<td>1989</td>
<td>53 (8.3)</td>
</tr>
<tr>
<td>1990</td>
<td>129 (20.2)</td>
</tr>
<tr>
<td>1991</td>
<td>128 (20.1)</td>
</tr>
<tr>
<td>1992</td>
<td>101 (15.8)</td>
</tr>
<tr>
<td>Total</td>
<td>423 (66.3)</td>
</tr>
</tbody>
</table>

Out of 423, 405 health care workers reported the place of exposure: 26.4% were exposed in a patient room's, 17.7% in an emergency room, and 12.2% on a ward. As expected, nurses received the majority of their exposures in the patient's room. Among physicians, 22 of 59 exposures were in an emergency room (Table 2).

Nineteen percent of health care workers (81 of 423) recalled at least other occupational exposure. Exposures from HIV-positive patients comprised 23.2% of occupational exposures. The staff category was reported for 406 subjects; nursing was the profession with more exposures (56/406) from high-risk patients. The baseline risk of HIV seroconversion was 0.00%. The upper bounds of the 95% CI for the risk of seroconversion after percutaneous or mucous membrane exposure from infected patients with HIV in our study are 3.42% and 23.84%, respectively (Table 3).

Respondents indicate that most exposures (95%) were percutaneous, 4% mucous membrane contacts and 1% skin contacts. Overall, 88.3% of exposures (370/419) were described as blood contact and 71.8% had resulted from needlestick and suture needles. In 47 of 98 health care workers, a serum sample was tested for HIV antibody at least 180 days after exposure; the remaining 41 workers have not yet complete the follow-up (Figure 1). There was a significant difference in the observance of three controls when the patient was a known HIV-infected patient, in physicians ($p = 0.00009$) and nurses ($p = 0.00001$), when we compared HIV-positive patients in whom the HIV status was unknown or negative; in the remains groups of health care workers the differences were not statistically significant. When the body fluid was blood, the percent of health care workers who finished the follow-up (24.1%) was rather higher than in the remaining inoculs (16.32%).