SHORT REPORT

Occupational hepatitis C seroconversions in a Brazilian hospital

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Background
There are six known cases of occupational human immunodeficiency virus (HIV) seroconversion in Brazil. However, there are neither published cases of occupational hepatitis C virus (HCV) seroconversion nor systematic studies of blood and body fluid exposures (BBFE) that could estimate the risk of HCV or HIV occupational seroconversion in Brazil.

Aims
To describe the outcomes of BBFEs in a Brazilian hospital over 12 years and 2 months.

Methods
Statistical analysis of a computerized database of exposure events recorded on printed forms. Incidence rates (IR) were calculated as the number of BBFE per 100 full-time equivalent worker-years.

Results
There were 1457 BBFE, 87% being percutaneous and 561 (38%) recurring in health care workers (HCWs) who reported having previous exposures. The highest IRs occurred in laboratory technicians (9.7), medical students (9.5), cleaning staff (9.5) and nursing aids (9.2). The IR in temporary employees was 13.0. Two HCWs, a nursing aid and a surgeon, seroconverted to hepatitis C after HCV exposures involving 13 G catheter needles. The risk of acquiring a HCV infection was 2 in 38 percutaneous HCV exposures, i.e. 5% (95% CI: 0.89–16.3). There were no seroconversions to HIV despite 80 percutaneous HIV exposures.

Conclusions
HCV has a higher potential for occupational transmission than HIV. Measures to reduce the risks of BBFE and occupational transmission of blood-borne viral infections should be improved in Brazil.

Key words
Hepatitis C; needlestick injuries; occupational disease transmission.

Introduction
Blood and body fluid exposures (BBFE) are an important problem in health care workers (HCWs). By 2006, four Brazilian cases of occupationally acquired human immunodeficiency virus (HIV) had been reported [1]. Two more occupational acquired immunodeficiency syndrome cases were described in 2006 and 2007 [2]. None of the 396 allegedly occupational cases of hepatitis C virus (HCV) infection reported to the Brazilian Ministry of Health since 2001 have ever been published in the scientific literature. The circumstances in which they occurred are uncertain, and no studies relate any of them to a trustworthy denominator from which a risk rate could be estimated.

Seroprevalence rates of 2–10% for HCV, 8–14% for hepatitis B virus (HBV) and 14–20% for HIV were described in Brazilian source patients involved in BBFEs [3]. These are higher than the reported seroprevalence rates in the general Brazilian population, of 5% for HBV and 0.6% for HIV [4], although there is much regional variation. HCV seroprevalence rates are not precisely known but are estimated to be 1.5% for the whole country and 2.6% for Rio de Janeiro state [4]. This may be an underestimate, as the commonest reason for liver transplantation in the major transplant centre in this region is cirrhosis due to hepatitis C infection [5].

This study analysed all BBFEs reported from November 1997 to December 2009 in a Brazilian university hospital.

Methods
The study was approved by the Research Ethics Committee of the School of Medicine/Universidade Federal Fluminense. We analysed all BBFEs reported...
between 1st November 1997 and 31st December 2009 in a 240-bed Brazilian public hospital in the state of Rio de Janeiro. Details of all exposures reported by HCWs, including chemoprophylaxis, follow-up and the serological status of HCWs and source patients at the time of the BBFE and afterwards were recorded on forms by the hospital’s infectious diseases department. Data from the forms were later entered into a computerized database, which we analysed using SPSS version 17. Full-time equivalent (FTE) worker-years [6] for the entire study period were calculated from the staff group numbers for 2009 and the number of weekly hours worked by each group. Risks were calculated as incidence per 100 FTE worker-years.

**Results**

In 2009, the hospital workforce size was 1315 people, including nursing aids (43%), registered nurses (15%), physicians (27%), laboratory technicians (8%) and cleaners (6%), all working in shifts. Sixteen per cent were contractors and/or temporary employees. Being a university hospital, there were also 1056 students of medicine (23%), dentistry (49%) and nursing (28%), and 318 teachers. Seroprevalence rates among the HCWs in our study were 6% for HBV, 0.2% for HIV and 1% for HCV.

There were 1457 exposures reported in 1193 HCWs in the study period. Of these, 70% (1020) occurred during care of vascular lines, small surgical procedures and injections, 15% occurred while ‘cleaning the environment’, 83% involved blood and 87% were percutaneous. Recapping needles and needles and sharp devices disposed in waste bags or left on countertops, on beds or in patient clothes each resulted in 12% of exposures. In 38% (561) of exposures the HCW reported having had a previous exposure (264 during the study period and 297 previously). Sixty exposures involved large needles (mostly 14–16 G catheter needles), and in six of these exposures the source patient was HCV-infected.

Two HCWs, a nursing aid and a surgeon, seroconverted to hepatitis C following percutaneous exposures involving 13 G catheter needles. Both HCWs had previous exposures to blood seronegative for HIV, HBV and HCV. Neither had any other risk factors for HCV infection other than their reported occupational exposures. The nursing aid tested negative for anti-HCV antibody 2 days after reporting a second exposure but subsequently became positive about 6 weeks later following a rise in liver enzymes. The surgeon developed raised liver enzymes and became seropositive for hepatitis C approximately 6 weeks after reporting a second exposure. Viral load was 42 882 100 (log 7.63) and persisted at this level over 1 year. Treatment was commenced with pegylated interferon and ribavirin with a rapid virologic response (HCV RNA undetectable) in 1 month. In both cases no viral genotyping or phylogenetic analyses were done. The estimated risk of HCV infection was 2 in 38 percutaneous exposures to a HCV-infected source, i.e. 5% (95% CI 0.89–16.3).

**Discussion**

We found two HCV seroconversions following 38 (5%) percutaneous exposures to HCV-infected sources. Both involved large bore catheter needles. We found no HIV seroconversions despite 80 percutaneous exposures to HIV-infected sources.

However, as a limitation to our study, we had no means of assessing the rate of underreporting, which is usually high [6,7]. Virological genotyping and/or phylogenetic analysis to match the HCV in the source patients and the exposed health care workers would have made the cases for occupational transmission stronger. However, both health care workers tested negative for HCV infection shortly after their exposures and subsequently seroconverted within a timeframe consistent with transmission from their reported exposures, and neither had any other risk factors for HCV infection.

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**Table 1. HIV, HBV and HCV status in source patients**

<table>
<thead>
<tr>
<th>Serological status</th>
<th>Reactive, n (%</th>
<th>Non-reactive, n (%)</th>
<th>Not tested, n (%)</th>
<th>Seroprevalence rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV</td>
<td>112 (9)</td>
<td>937 (76)</td>
<td>181 (15)</td>
<td>10.7</td>
</tr>
<tr>
<td>HCV</td>
<td>50 (4)</td>
<td>650 (53)</td>
<td>530 (43)</td>
<td>7.1</td>
</tr>
<tr>
<td>HBV</td>
<td>22 (2)</td>
<td>677 (55)</td>
<td>531 (43)</td>
<td>2.6</td>
</tr>
</tbody>
</table>

A source patient could be identified in 1230 exposures.

*HBsAg and/or HBeAg.

**Table 2. Incidence rates according to staff group**

<table>
<thead>
<tr>
<th>Staff group</th>
<th>Number of HCW (2009)</th>
<th>FTEs worked over the study</th>
<th>Number of BBFE over the study</th>
<th>Incidence ratea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory technicians</td>
<td>92</td>
<td>897</td>
<td>87</td>
<td>9.7</td>
</tr>
<tr>
<td>Medical students</td>
<td>240</td>
<td>2080</td>
<td>149</td>
<td>9.5</td>
</tr>
<tr>
<td>Cleaning staff</td>
<td>86</td>
<td>1118</td>
<td>106</td>
<td>9.5</td>
</tr>
<tr>
<td>Nursing aids</td>
<td>563</td>
<td>5489</td>
<td>504</td>
<td>9.2</td>
</tr>
<tr>
<td>Physicians</td>
<td>376</td>
<td>3666</td>
<td>316</td>
<td>8.6</td>
</tr>
<tr>
<td>Nurses</td>
<td>198</td>
<td>1930</td>
<td>92</td>
<td>4.8</td>
</tr>
<tr>
<td>Nursing students</td>
<td>300</td>
<td>1950</td>
<td>47</td>
<td>2.4</td>
</tr>
<tr>
<td>All functional categories</td>
<td>2689</td>
<td>23585</td>
<td>1457</td>
<td>6.2</td>
</tr>
<tr>
<td>Contractors and/or temporary employees</td>
<td>195</td>
<td>3019</td>
<td>387</td>
<td>12.8</td>
</tr>
</tbody>
</table>

aIncidence rates by 100 FTE worker-years [6].
Previous estimates of seroconversion risk after needlestick exposure are 0.3% for HIV, 6–30% for HBV and 1.8% (0–7%) for HCV [7]. Accidents involving hollow-bore needles are particularly risky, since these devices often contain residual blood [7], and large gauge needles have the potential to inoculate greater volumes of blood. In many Brazilian studies, the staff groups most involved in BBFEs are nursing aids, dentists and cleaners [3,8,9]. The high incidence in cleaners probably reflects inappropriate disposal of sharps, as cleaners should have no contact with sharps [3].

In our hospital, laboratory technicians include the blood collecting team, which may explain their high incidence of exposures in our study. The high incidence of exposure in temporary employees may be associated with unfamiliarity with local working practices.

In our study, seroprevalence rates for HCV, HBV and HIV in source patients were 7.1, 2.6 and 10.7%, respectively, similar to those described in other Brazilian studies [3]. The seroprevalence rates in the HCWs in our study were similar to the Brazilian population at large.

Occupational transmission of blood-borne viral infections such as HCV through BBFEs should be preventable. Our findings suggest that measures to reduce the risk of BBFE should be improved in Brazil. These might include safer systems of work with blood, body fluids and sharps, better HCW training and the use of safety engineered devices. Indeed, some of these measures have been embraced by the Ministry of Work and Employment and are now enforced by law in Brazilian hospitals [10].

Key points

- The seroconversion rate to hepatitis C following exposures to infected blood in Brazilian health care workers was 5%.
- Fifteen per cent of exposures occurred while ‘cleaning of the environment’, most of them involving needles and sharp devices disposed in waste bags or left on countertops, on beds or in patient clothes.
- Measures to reduce the risks of blood and body fluid exposures and occupational transmission of blood-borne viral infections should be improved in Brazil.

Conflicts of interest

None declared.

References