Health care workers’ exposure to blood-borne pathogens in Lebanon

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Background Accidental exposure to blood-borne pathogens (BBPs) is a risk for health care workers (HCWs).

Aim To study the pattern of occupational exposure to blood and body fluids (BBFs) at a tertiary care hospital.

Methods This study reports a 17-year experience (1985–2001) of ongoing surveillance of HCW exposure to BBFs at a 420-bed academic tertiary care hospital.

Results A total of 1590 BBF exposure-related accidents were reported to the Infection Control Office. The trend showed a decrease in these exposures over the years with an average ± standard error of 96 ± 8.6 incidents per year. In the last 6 years, the average rate of BBF exposures was 0.57 per 100 admissions per year (average of needlestick injuries alone was 0.46 per 100 admissions). For 2001, the rates of exposure were found to be 13% for house officers, 9% for medical student, 8% for attending physicians, 5% for nurses, 4% for housekeeping, 4% for technicians and 2% for auxiliary services employees. The reason for the incident, when stated, was attributed to a procedural intervention (29%), improper disposal of sharps (18%), to recapping (11%) and to other causes (5%).

Conclusions The current study in Lebanon showed that exposure of HCWs to BBPs remains a problem. This can be projected to other hospitals in the country and raises the need to implement infection control standards more efficiently. Similar studies should be done prospectively on a yearly basis to study rates and identify high-risk groups.

Key words Blood-borne pathogens; health care workers; percutaneous; sharps injuries.

Introduction Exposure to blood-borne pathogens (BBPs) continue to pose a significant risk to health care workers (HCWs) [1], despite the introduction of regulatory strategies designed to decrease the incidence and danger from such exposures [2] and the use of safer devices (i.e. engineering controls) [3]. Although the US Occupational Safety and Health Administration requires employers to maintain sharps injury log records [4], the number of such injuries among HCWs is difficult to estimate mainly due to under-reporting [5]. Based on WHO criteria, Lebanon ranks among the countries with moderate endemicity for hepatitis B virus (HBV) [6,7], while studies on seroprevalence of hepatitis C virus (HCV) ranged between 0.4% among HCW [8] and 0.6% among Lebanese blood donors [9]. On the other hand, human immunodeficiency virus (HIV) remains a concern in Lebanon and the disease burden is still unknown. Latest reports showed a cumulative number of 813 diagnosed HIV cases for a 3.4 million population [10]. However, some of the Lebanese medical institutions and hospitals have only recently implemented infection control programs (ICP) including reporting of injuries, performing necessary tests and administering prophylaxis. With the availability of an effective HBV vaccine and with the increasing number of populations worldwide that are being immunized through initiatives by the WHO, HCWs remain among the high-risk groups that need immediate protection. Identifying HCWs exposed to patients with HIV is critical for applying and
implementing post-exposure prophylaxis (PEP). In cases of HCV, a minimum of appropriate testing at the correct time interval is important in facilitating early detection of HCV infection and prompt referral for specialist advice.

In an effort to introduce effective interventions through effective vaccination policies and campaigns, we retrospectively studied the trend of these exposures, measured the extent of the problem and created baseline data for future improvement. In this study, we present the surveillance of needlestick injuries (NSIs) and other occupational exposures to blood and body fluids (BBFs) among HCWs at a tertiary care centre in Lebanon from 1985 to 2001 inclusive with an attempt to identify potential areas for improvement.

**Methods**

A retrospective evaluation of the ‘personal accident reports’ sent to the ICP at the American University of Beirut Medical Center (AUBMC) between January 1985 and December 2001 (17-year period) was carried out. AUBMC is a 420-bed tertiary care centre that receives patients from all regions of the country. The ICP keeps record of all sharp injuries and other occupational exposure accidents. All house staff, faculty and students at AUBMC are required to report and fill a personal accident report whenever exposed to BBFs or sharps.

The reports were reviewed for date, place, nature and cause of accident, demographics and status of individuals involved and post-exposure management. An exposure is defined as specific eye, mouth or other mucous membrane, non-intact skin or parenteral contact with blood or other potentially infectious body fluid. Prior approval to review these reports was obtained from the Ethical Committee of the Institutional Review Board and the Chief of Staff Office.

The primary end point was the annual number, nature (needlestick, blades, stylets, glass, spill or splash and other sharp) and cause of accidents (improper disposal of sharps, procedural interventions including surgery, minor procedures, phlebotomy and intravenous insertion, recapping of needles and other causes). Secondary end points recognized the status of the HCW involved in the accident, the tool with which injury was sustained, the location of the accident as per floor or unit, the HIV/ HBV status of the source of the BBF, PEP and impact of interventions on the incidence of accidents.

**Results**

Between 1985 and 2001, 1590 BBF exposure-related accidents were reported to the ICP. The number of reports ranged between 39 and 161 per year with an annual mean ± standard error of 96 ± 8.6. The incidence of all BBF exposures reported over the years is shown in Figure 1. Fifty-five per cent of exposures involved female employees and 45% involved male employees. There was a decrease in exposures over the years, with the average rate of BBF exposures being 0.57 per 100 admissions per year in the last 6 years.

The average rate of NSIs alone was 0.46 per 100 admissions per year (the rate of reported NSIs per 100 admissions for the years 1996–2001 was 0.57 in 1996, 0.45 in 1997, 0.15 in 1998, 0.6 in 1999, 0.56 in 2000 and 0.41 in 2001).

The distribution of BBF exposure incidents by type of injury, occupational category of HCW, site of injury and

![Figure 1. Incidence of BBF exposure over the years by type.](image-url)
reason of incident is presented in Table 1. The frequency of each occupational category is similar to the actual distribution of employees among the departments (46% of hospital employees are nurses, 13% house officers and 10% students). The year 2001 was chosen as a representative year and rates were calculated for that year for each occupational category. Thirteen per cent of house officers, 9% of students, 8% of attending physicians, 5% of nurses, 4% of housekeeping staff, 4% of technicians and 2% of auxiliary services’ employees had BBF exposure-related accidents during that year.

Of the 1590 incidents reported, the patient or source of incident was known in 64% of cases. Source testing for HIV was performed in 20% of all cases and 1% of those tested were seropositive (3/329). Of the 64% of the reported incidents that were tested for HBV, 21% were hepatitis B surface antigen (HBsAg) positive. The HCWs involved in accidents with HIV-positive patients received prophylactic triple anti-retroviral therapy as recommended by the Centers for Disease Control and Prevention guidelines. When immunity was checked among the exposed HCWs, 22% were found to be immune to hepatitis B. All those involved in accidents with HBsAg-positive sources and who were not immune or vaccinated received passive immunization by hyperimmunoglobulin for hepatitis B in addition to active immunization through vaccination.

Some issues that were not addressed in this report were noted by the involved personnel dealing with exposure injuries at our institution; for example, HCWs were more likely to present with panic when exposures occurred on weekends. They often had difficulty remembering their immunization status, and if they did, they were unlikely to remember whether they were responders or non-responders. House officers and students when reporting late were advised to do so by a colleague or nurse, and most HCWs did not carry their updated immunization cards during working hours and were unaware of the instructions these contained.

### Discussion

Our study found the average annual incidence rate of BBF exposure in HCWs to be 0.57 BBF exposures per 100 admissions per year. Seventy-five per cent of the exposures were due to NSIs and 13% of house officers had BBF exposure-related accidents. Interventions including education and immunization campaigns appear to have brought about improvement in the exposure rate.

This study has a number of limitations including the fact that it was retrospective and not planned *a priori*. Thus, some information related to the exposures was lacking, for example, the type of exposure (percutaneous, mucocutaneous and non-intact skin), type of blood (venous, capillary, culture, etc.) and when the incident occurred exactly during the procedure. Other limitations include the fact that we elected to study the year 2001 as a sample to study rates because it was difficult to obtain the exact numbers of HCWs for all the years studied, and finally, the lack of tracking of the exposed HCW and the limited number of cases undergoing PEP warrants further work to create recall systems and improve follow-up.

Despite these limitations, the importance of this study lies in providing data on the extent and significance of the problem. Such documentation is a first step in adopting strong policy initiatives especially in developing countries. Resistance to new prevention policies for HCWs is likely to be strongest where there is lack of data, especially the ‘no data, no problem’ syndrome, is a prevalent occurrence in the developing world [11].

In hospitals of comparable number of beds (400 to 500 beds), up to 100 exposures may be reported annually, keeping in mind that this number is probably an underestimate of the frequency of actual occurrence by 10–62% [12,13]. The Centers for Disease Control and Prevention estimate that 600 000–800 000 occupational NSIs occur among HCWs yearly in USA but half go unreported [14], while in the UK, the true

### Table 1. Distribution of BBF exposure incidents by type of injury, occupational category of health care worker, site of injury and reason of incident

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needlestick</td>
<td>1192 (75)</td>
</tr>
<tr>
<td>Sharp object</td>
<td>159 (10)</td>
</tr>
<tr>
<td>Splash and spill</td>
<td>48 (3)</td>
</tr>
<tr>
<td>Unspecified</td>
<td>191 (12)</td>
</tr>
<tr>
<td>Occupational category</td>
<td></td>
</tr>
<tr>
<td>Attending physician</td>
<td>64 (4)</td>
</tr>
<tr>
<td>House officer</td>
<td>223 (14)</td>
</tr>
<tr>
<td>Medical or nursing student</td>
<td>222 (14)</td>
</tr>
<tr>
<td>Nurse</td>
<td>747 (47)</td>
</tr>
<tr>
<td>Technician</td>
<td>127 (8)</td>
</tr>
<tr>
<td>Housekeeping staff</td>
<td>159 (10)</td>
</tr>
<tr>
<td>Auxiliary staff</td>
<td>48 (3)</td>
</tr>
<tr>
<td>Site of injury</td>
<td></td>
</tr>
<tr>
<td>Ward</td>
<td>565 (35)</td>
</tr>
<tr>
<td>Operating room</td>
<td>269 (17)</td>
</tr>
<tr>
<td>Intensive care units</td>
<td>238 (15)</td>
</tr>
<tr>
<td>Emergency room</td>
<td>165 (10)</td>
</tr>
<tr>
<td>Laboratory</td>
<td>68 (4)</td>
</tr>
<tr>
<td>Delivery suite</td>
<td>56 (4)</td>
</tr>
<tr>
<td>Nursery</td>
<td>55 (4)</td>
</tr>
<tr>
<td>Radiology</td>
<td>32 (2)</td>
</tr>
<tr>
<td>Others</td>
<td>142 (9)</td>
</tr>
<tr>
<td>Reason of incident</td>
<td></td>
</tr>
<tr>
<td>Procedural intervention</td>
<td>461 (29)</td>
</tr>
<tr>
<td>Improper disposal of sharps</td>
<td>286 (18)</td>
</tr>
<tr>
<td>Recapping</td>
<td>175 (11)</td>
</tr>
<tr>
<td>Other reasons</td>
<td>80 (5)</td>
</tr>
<tr>
<td>Not documented</td>
<td>588 (37)</td>
</tr>
</tbody>
</table>
rate of sharps injury reached as much as 10 times the reported rate [15]. Reasons for not reporting included potential stigma, underestimating the risk of acquiring dangerous blood borne infections, considering the process as ‘too time consuming’ or ‘did not consider anything could be done’ [16–19]. Under-reporting also varies by number of injuries, occupation and type of exposure [3]. It was reported that having a history of a greater number of injuries was associated with lower reporting, while having another person know about the injury at time of occurrence was a predictor of reporting [19].

Doctors (house officers and attending physicians) had the highest rates of accidental exposure to BBFs, followed by students and then nurses, whereas published reviews and surveys on the topic showed that nurses and secondly doctors were most at risk of sharps injuries and exposure to BBPs [20,21]. The lower rate of injuries among nurses (5%) compared with physicians (13%) could be related to nurses being under close scrutiny in our institution and being continuously provided with education on this issue. Physicians may be more inclined to make their own risk assessment before deciding how to proceed. As for students, and in view of their lack of experience in patient care and surgical techniques, they may be at an increased risk of exposure to BBPs [22]. Most of the injuries of housekeeping employees were consequences of non-compliance: inappropriately discarded needles in rubbish bins or among laundry items while being gathered from the floors.

NSIs were the most common cause of injury (~75%) in this study, which is concordant with previous studies [12,23]. Most of the injuries occurred during a procedural intervention while improper disposal of sharps and recapping occurred less frequently. Recent reports indicated that injuries which occurred during a clinical procedure (IV line related, splash of fluid, restless patient and handling/passing device) accounted for 24%, those which occurred after a clinical procedure but before disposal (collision with HCW/sharp, disposal related, clean up and recapping) for 48% and injuries which occurred after disposal (concealed sharps) for 28% [24–26].

The low percentage of patients who had their blood tested for HIV (20%) can be explained by refusal of patients to be tested and absence of strict protocols. Even though the prevalence of HCV in Lebanon is low [8,9], the high rate of transmissibility, the absence of PEP and the confusion in the application of virological markers to the management of patients [27] warrants strict implementation of preventive infection control measures. In the UK, the majority of HCW exposures were to an HCV-positive source, accounting for 47% (997/2140) of all initial reports, with HIV reports accounting for 26% and HBV for 9% [27].

Occupational exposure to BBFs continues to occur regularly among HCWs due to non-adherence to policies and under-reporting. The US General Accounting Office report on NSIs suggested that of the projected 236 000 NSIs annually in US hospitals, 75% were preventable. Of those, 25% could be eliminated through inappropriate or unnecessary use of needles (e.g., eliminate the use of needles as connectors in IV lines), 29% by using needles with safety features and 21% through safer work practices [28].

As policy implications, institutions thus need to prevent BBPs exposure of HCWs within the hierarchy of controls concept, which includes (i) reducing the use of needles and other sharps when possible, (ii) ensuring good engineering controls and (iii) educating all employees on work practice controls and personal protective equipment along with obligatory vaccinations against BBPs [29]. As such, safety must be integral to organizational culture and everyday practice. In this context, hospital administrators and the infection control team should build safety consciousness and prompt staff to adopt participation in a ‘culture of safety’, wherein everyone commits to personal responsibility for safety. The infection control team should document circumstances and devices related to the injury and should amplify surveillance to detect rare events. Administrators should not make HCW safety a low priority when protective measures for their employees require a financial commitment. On the individual level, HCWs should consider every patient receiving medical care as potentially carrying a BBP and the culture of altruism and self-consideration should be encouraged in order to protect oneself and others.

Data from this study can be projected to other hospitals in the country and raise the need to implement infection control standards more efficiently. Similar studies should be done prospectively on a yearly basis, while understanding the circumstances surrounding these exposures to identify high risk and priority groups and taking into consideration the selective influences on recruitment or retirement of certain health care occupations. This affords the opportunity to foresee and monitor trends and to develop focused interventions.

Key points

- Occupational BBF exposure continues to occur regularly among HCW at our centre but a trend of improvement occurred from 1998.
- Despite the availability of adequate post-exposure measures and immunization, they are not strictly adhered to due to under-reporting or delays in reporting.
- Data from this study indicate that most BBF exposures can only be prevented by implementing a culture of safety within the organization.
Conflicts of interest

None declared.

References