ABSTRACT | Background: Exposure to biological materials is common among hospital workers, even when preventive measures are suggested. Few studies assessed the incidence of this type of exposure and the impact of preventive measures. Objective: The aim of the present study was to describe occupational exposure to biological materials at Base Hospital of Bauru, São Paulo, Brazil, along one year. Methods: Observational retrospective study conducted with data for 2014, which were analyzed according to epidemiological and occupational exposure characteristics before and after exposure, such as previous immunization and follow up of workers, respectively. Results: Forty-two accidents involving biological materials were recorded; 85.7% affected the nursing staff, mainly nursing technicians. The incidence of accidents involving sharp materials was 83%; the upper limbs were the most frequently affected (81%) body part. Vaccination campaigns and specific care protocols achieved effective results, allowing to avoid disease transmission and reducing the costs associated with the follow up of affected healthcare professionals. Few accidents (17%) occurred during emergency procedures, which shows that most instances of exposure might be prevented through safety measures. Conclusion: The study revealed some aspects of the workers involved, exposure type and follow up after accidents with biological materials at the investigated hospital and discusses measures likely to reduce risk.

Keywords | environmental exposure; accident prevention; occupational risks.

RESUMO | Contexto: A exposição a material biológico é comum em hospitais, mesmo quando medidas preventivas são propostas. Poucos estudos avaliaram a incidência desse tipo de exposição e o impacto de medidas de prevenção. Objetivo: O objetivo deste estudo foi descrever as exposições ocupacionais a material biológico ocorridas no Hospital de Base de Bauru durante um ano. Métodos: Estudo observacional e retrospectivo com dados de 2014 analisados segundo características epidemiológicas e da exposição ocupacional antes e após a exposição, como imunização prévia e seguimento dos profissionais. Resultados: Foram registrados 42 acidentes com exposição a material biológico, 85,7% envolvendo a equipe de enfermagem, principalmente técnicos. A incidência de acidentes com materiais perfurocortantes foi de 83% e os membros superiores foram a área corporal mais atingida (81%). As campanhas vacinais e os protocolos específicos de atendimento foram eficazes, evitando a transmissão de doenças e reduzindo custos com o seguimento dos profissionais de saúde acometidos. Poucos acidentes (17%) ocorreram em procedimentos de urgência, sugerindo que a maioria das exposições pode ser prevenida por medidas de segurança. Conclusão: O estudo mostrou aspectos sobre o profissional envolvido, tipo de exposição ocorrida e seguimento após a incidência de acidentes com material biológico no hospital, discutindo medidas que poderiam ser aplicadas em exposições a material biológico.

Palavras-chave | exposição ambiental; prevenção de acidentes; riscos ocupacionais.

Study carried out at Bauru Base Hospital of Foundation for Medical and Hospital Development (Fundação para o Desenvolvimento Médico e Hospitalar — FAMESP) – Bauru (SP), Brazil.

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INTRODUCTION

Occupational exposure to biological materials still remains as a challenge to both institutions and workers. The information on this subject is scarce and poorly divulged in Brazil, as instances are seldom reported.1

Within the hospital setting, the employees most exposed to biological materials are the ones who spend more time in direct patient care. In addition, there are several factors associated with occupational exposure, such as inadequate use of personal protective equipment, long working hours, shortage of human resources, inefficacious continued education, substandard training and persistent bad habits among some professionals.2,3 The relevance of occupational exposure goes much beyond the mere occurrence of simple injuries, since it has psychosocial repercussions for workers, such as changes in their social, family and work relationships.4-6

Considering all these factors and the need for change in the current scenario, the aim of the present study was to describe the profile of occupational exposure to biological materials at Bauru Base Hospital (Hospital de Base de Bauru — HBB) along one year.

METHODS

The present was a retrospective observational study that analyzed data recorded at HBB from January through December 2014. All the employees who underwent occupational exposure to biological materials were referred to the hospital reception and then to the biological material exposure outpatient clinic as per the institutional protocol. Information was entered in the outpatient clinic forms and included personal (age, sex, occupation, vaccination before event, length of work in the current position, shift) and accident-related (date, department, involved part of the body, material involved in exposure, whether under emergency or routine conditions) data. We also collected data on follow up after the accident (performance of tests by both employee and source-patient, length of follow up after exposure and development of not of disease). The sample comprised employees provided cared from January to December 2014.

RESULTS

SOCIODEMOGRAPHIC DATA

A total of 42 accidents involving biological materials were recorded by HBB from January through December 2014, 36, i.e., 85.7%, of which involved the nursing staff. Most of the employees who suffered accidents were female (83%), nursing technicians (69%) and aged 41 to 50 years old (36%) median 37 years old. In 35 cases (83%) the accidents were due to percutaneous exposure, and the upper limbs were the body part most frequently involved (81%). The annual incidence of occupational exposure at the analyzed institution was 2.4% (42 instances for a total of 1,722 employees). The distribution of employees provided care for accidents involving biological materials per occupational category was as follows: 69% nursing technicians (29 cases), 17% nurses (7), 12% physicians (5) and 2% cleaning personnel (1).

Table 1 describes the distribution of the sample per age range.

Table 1. Age ranges of victims of accidents involving exposure to biological materials.

<table>
<thead>
<tr>
<th>Age range (years)</th>
<th>Number of employees</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-30</td>
<td>12</td>
<td>28.5</td>
</tr>
<tr>
<td>31-40</td>
<td>12</td>
<td>28.5</td>
</tr>
<tr>
<td>41-50</td>
<td>15</td>
<td>36.0</td>
</tr>
<tr>
<td>51-60</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>&gt;60</td>
<td>1</td>
<td>2.0</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>100</td>
</tr>
</tbody>
</table>
About 17% among the 42 cases of occupational exposure recorded for 2014 occurred during urgent/emergency care delivery.

**PRE-EXPOSURE MEASURES**

All the employees involved in accidents reported having received full vaccination against hepatitis B and having performed anti-HBs antibody testing to determine the circulating antibody levels. Eight (19%) were non-respondents to vaccination and 34 (81%) had anti-HBs levels that characterized them as fully protected against hepatitis B.

**POST-EXPOSURE MEASURES**

In regard to the tests performed for the exposed employees, the ones previously tested and exhibiting adequate anti-HBs antibody levels were only tested for anti-human immunodeficiency virus (anti-HIV) and anti-hepatitis C (anti-HCV) antibodies to investigate a possible contact with these viruses. In one single case screening tests for syphilis were performed as a function of the personal history of the source-patient.

Most of the involved source-patients (95%) were known, and only in three cases they had some contagious disease, including HIV (1 case), HCV (1) and syphilis (1).

Only 7 (17%) among the 42 employees who suffered accidents required chemoprophylaxis against HIV. In all these cases the expanded regime was applied (two nucleoside reverse-transcriptase inhibitors — NRTI — and one ritonavir-boosted protease inhibitor) as per the institutional protocol. Chemoprophylaxis against HIV was discontinued in five cases once the status of the source-patient was established. Chemoprophylaxis was continued in only two cases; in one the source-patient was HIV positive, and in the other the accident involved exposure to a material of unknown origin at the contagious disease ward.

None of the exposed female employees was pregnant or puerperal. In regard to follow up, 7 employees discontinued the clinical-laboratory monitoring afforded by the institution after exposure.

**TEMPORAL AND LOCATION DATA**

Figure 1 describes the monthly distribution of accidents involving exposure to biological materials in 2014.

**DISCUSSION**

The results show that exposure to biological materials predominated among women, adults and nursing technicians. Since women compose most staffs and

<table>
<thead>
<tr>
<th>Table 2. Anatomical characteristics of exposure to biological materials.</th>
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<tbody>
<tr>
<td><strong>Anatomical characteristics</strong></td>
</tr>
<tr>
<td>-------------------------------</td>
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<tr>
<td><strong>Type of exposure</strong></td>
</tr>
<tr>
<td>Percutaneous</td>
</tr>
<tr>
<td>Mucosal</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td><strong>Body parts</strong></td>
</tr>
<tr>
<td>Upper limbs</td>
</tr>
<tr>
<td>Oral/eye mucosa</td>
</tr>
<tr>
<td>Trunk</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

**Figure 1. Monthly number of accidents involving biological materials in 2014.**
Exposure to biological materials at Bauru Base Hospital

Technicians are the professionals who provide direct patient care most often, these workers are at higher risk of exposure.

Similar results were obtained by the studies conducted by Santos et al. in Teresina, Piauí, Brazil, in which 84% of the involved workers were female, and Spagnuolo et al. in Londrina, Paraná, Brazil, in which the rate was 73.5%. In both studies the nursing staff was the category with highest occupational exposure to biological materials. As concerns variable age, practically all age ranges are likely to be exposed to biological materials, which points to the need to change habits consolidated along everyday work, including training on correct use of personal protective equipment and adoption of standard precautions across all stages of care delivery.

Standard precautions are some among the actions implemented to reduce the risk of occupational exposure, and include attention during the manipulation of sharps, disposal in proper facilities, use of personal protective equipment and not recapping needles. Other measures to be adopted are: training of multi-professional staffs, revision of techniques, implementation of protocols, acquisition of specialized devices and promotion of safer environments.

Percutaneous exposure predominated, mainly involving the upper limbs; the hands were the body parts most often affected in association with the handling of hospital supplies and performance of procedures. The high incidence of this type of occupational exposure reinforces the need for surveillance and continued training in the management of sharps.

Similar results were obtained in the study by Spagnuolo et al., who found that 92.5% of the recorded exposures involved sharps, and that the type of exposure was directly related to the job position.

As concerns pre-exposure measures, all the employees had been previously immunized against hepatitis B and 81% exhibited immunity markers as a result of the immunization campaigns conducted at HBB. Also relevant is the fact that measurement of anti-HBs antibodies had already been performed for all the employees, which allowed for a priori identification of non-respondents to vaccination against hepatitis B. The results of other two studies were inferior in this regard: in Lima et al.’s study, 97% of the workers had been vaccinated against hepatitis B and 74.4% exhibited immunity markers, and in the sample analyzed by Spagnuolo et al., 74.3% had received previous immunization against hepatitis B.

Figure 2. Exposure to biological materials per hospital area.

Figure 3. Hospital areas and type of exposure to biological materials.
One of the advantages of high rates of protection against disease is that such pre-exposure measure allows rationalizing the use of anti-hepatitis B immunoglobulin. The reason is that previously immunized workers do not need to receive immunoglobulin, which thus spares employees who suffered accidents from discomfort and reduces the financial costs for the institution. These facts reinforce the benefits of immunization campaigns within the hospital setting for health care professionals.

In regard to post-exposure measure, all the employees and known source-patients were subjected to testing as per the institutional protocols for occupational exposure to biological materials, and thus the measures taken for workers’ care were uniform. The cases exposed to biological materials from HIV-positive source-patients were followed up at the outpatient clinic. Visits and serological testing were performed 6 weeks, 3, 6 and 12 months after exposure; no case tested positive. Only 4.7% of the cases required chemoprophylaxis against HIV, which rate is smaller compared to the one reported by Lima et al., in whose study 8% of workers received prophylaxis. Higher rates were described by Marziale et al., who recommended prophylaxis to 76.7% of the exposed workers. As concerns follow up after exposure to biological materials infected with HCV, the one single case was monitored and the anti-HCV antibody measured 45, 90 and 180 days after the accident, the results being negative for all the tests, which demonstrates that contagion did not occur.

There was some seasonal variation in the incidence of accidents. The number of accidental exposures was twice as higher in September compared to all the other months, as Figure 1 shows. We were unable to find any explanation for this fact.

Finally, as to the distribution of accidents per hospital area, shown in Figures 2 and 3, the largest number of occupational exposures occurred in the intensive care unit and the surgical department. Similar findings were reported by Jorge et al., who attributed them to the fact that a large number of invasive and urgent and emergency care procedures are performed in these areas, which is also characteristic in our hospital.

Our study shows that the flow care delivery in compliance with the specific protocol for occupational exposure to biological materials and the vaccination campaigns against hepatitis B were clearly efficacious. All the exposed employees and source-patients were subjected to serology testing, and the involved workers were then provided care at an outpatient clinic specifically designated for this purpose. It is worth noticing that the vaccination campaigns against hepatitis B allowed avoiding unnecessary use of immunoglobulin, thus sparing costs to the hospital.

A final point deserving of mention is that only 17% of exposures occurred in urgent or emergency situations. This shows that most accidents took place under conditions in which there was no need for the employees to be exposed to further hazards, as the ones inherent to situations in which actions must be implemented over a shorter period of time. Some causes might be suggested for this fact: carelessness in routine situations, high-risk practices and work overload among the health care professionals. Possibly all these causes somehow contributed for exposure to occur. Prevention campaigns might be useful to avoid carelessness and practices that compromise safety during the performance of procedures. However, to reduce overload in health care work more investment on the professionals is needed, which requires the institution to develop specific policies for this purpose. As mentioned in the study by Oliveira Filho et al., the investigation of work accidents poses a challenges, brings more questions than answers and continuously demands additional exploration in further studies.

**CONCLUSION**

The present study evidenced relevant aspects of accidents involving exposure to biological materials at HBB, which might be compared to the ones at other hospitals to achieve a better understanding of the risk posed by such type of exposure. Vaccination against hepatitis B, measurement of the anti-HBs antibody, serological testing of source-patients and adequate follow up of employees at an outpatient clinic specifically designated for this type of exposure allowed for proper documentation of the risk of contagion and afforded the necessary support to the employees.
Exposure to biological materials at Bauru Base Hospital

REFERENCES


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