Management of accidental exposure to HCV, HBV and HIV in healthcare workers in Romania

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Abstract

Introduction **Accidental blood exposure in healthcare workers is an important issue worldwide. We present a study which analyzed the route of exposure, the source of infection and the post-exposure prophylaxis treatment administered.**

Method **We performed retrospective study of occupational exposure to HBV, HCV and HIV and the subsequent post-exposure prophylaxis among healthcare workers at the National Institute of Infectious Diseases "Prof.Dr. Matei Balș", Bucharest, Romania, from December 2002 to December 2011.**

Results **Sixty healthcare workers with a mean age of 36 reported an occupational exposure during a period of 9 years, 54 (90%) were females and 6 (10%) were males. 48 (80%) exposed healthcare workers were nurses, 7 (11.6%) were doctors and 5 (8.3%) were medical assisting staff. In 49 (81.6%) cases the exposure was percutaneous and in 11 (18.3%) cases the exposure was mucosal/corneal. Ten (16.6%) exposed healthcare workers had insufficient levels of antibody (HBsAb) response, (below 10 mIU/mL), 6 (10%) had titers between 11 and 500 mIU/mL, 31 (51.6%) between 501-1000 mIU/mL, and 13 (21.6%) above 1000 mIU/mL).**

Discussion **The exposure events analysis in this study yielded similar results compared to other previous parallel studies. Minimizing risks to HCWs for acquisition of blood-borne pathogens and correct and rapid post-exposure prophylaxis treatment in case of exposure should be an integral part of the infection control and occupational health programs in all healthcare facilities.**

Keywords **Accidental exposure, injuries, post-exposure prophylaxis, PEP, healthcare workers, HCW, HIV, HBV, HCV.**

Introduction

Healthcare workers (HCWs) have a risk for occupational infection following exposure to blood or bodily fluids, hepatitis B virus (HBV),[1,2] hepatitis C virus (HCV),[3] and human immunodeficiency virus (HIV) ranking as the most important pathogens, and requiring consideration of post-exposure prophylaxis (PEP).[4]

The Centers for Disease Control and Prevention (CDC) define "exposure" as a percutaneous injury (e.g., needlestick or cut with a sharp object) or contact of mucous membrane or nonintact skin (e.g., exposed skin that is chapped, abraded, or afflicted with dermatitis) with blood, tissue, or other bodily fluids that are potentially infectious.[5]

The risk of acquiring blood-borne pathogens depends on several factors. First, the prevalence of the infection in the general population and within the patient population served by the healthcare facility needs to be assessed. According to the CDC,[6] Romania is considered an intermediate-risk country for HBV,[7,8] with a 2-7% prevalence of chronic infection,[6] which is

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concordant with the results of a recent local epidemiologic study, pointing to a prevalence of 5.59%.[9] The same study found a 4.56% prevalence of HCV infection,[9] slightly higher than that recorded in another Romanian nationwide survey (3.23%).[10,11] As for HIV infection in Romania, recent data point to a prevalence of 0.1%.[12]

Second, the exposure route is important (i.e., exposure via percutaneous, mucosal, or nonintact skin). The percutaneous mode is the most efficient way of transmission, HBV having a relatively high risk of transmission, 6-30%[5,13] whereas for HCV and HIV the transmission risk is lower, 0.5%[13]-1.8%[5,14] and 0.3%[13]-0.41%[5,14] respectively.

Other parameters are the inoculum size, which depends on the volume of blood, the depth of penetration, and the viral load of the source (which can correlate with the state of infection in the source patient). The availability and efficiency of pre- and post-exposure prophylaxis also affect the risk of acquiring blood-borne pathogens.

The parameters above indicate that HBV is the most infectious of the three blood-borne viruses discussed here, and fortunately HBV infections can be prevented by safe and effective vaccination. In 1991 the Occupational Safety and Health Administration (OSHA) published the Bloodborne Pathogens Standard, stating that HBV vaccination should be offered at no cost to all HCWs with reasonable risk of exposure[15] and subsequent studies showed a decline of 95% in the incidence of hepatitis B infection among HCWs between 1983 and 1995.[16] Currently, there are no available options for pre-exposure prophylaxis for HCV or HIV.

The source patient should be tested as soon as possible for HBsAg, anti-HCV or HCV-RNA, and anti-HIV, unless the source is already known to be infectious. Post-exposure prophylaxis with hepatitis B immune globulin (HBIG) and/or vaccine is offered for HBV exposure. In case of HCV exposure, early treatment with interferon and/or antiviral agents for acute hepatitis C has relatively high cure rates that prevent the progression to chronic hepatitis C and its severe consequences.[14] In case of HIV[17-20] exposure, the 2005 CDC guidelines for the management of occupational exposure to HIV recommend antiretroviral therapy with two nucleoside reverse-transcriptase inhibitors (NRTIs) for lower risk exposures (solid needle, superficial wound, low source HIV viral load) and the addition of one or more drugs for higher risk exposures (hollow-bore needle with presence of visible blood on the device, or needle in contact with an artery or vein of the source patient), ideally initiating PEP within one to two hours from exposure, since any delay in efficacy appears to reduce the efficacy of the intervention.[20,21]

Regardless of whether prophylaxis was given, a follow-up serology should be performed at six weeks, three months, and six months after exposure.[21]

Methods

We performed a retrospective study to assess the incidence of accidental blood exposure in healthcare workers at the National Institute of Infectious Diseases "Prof.Dr. Matei Balș", Bucharest, Romania, during the past nine years, from December 2002 to December 2011. We also analyzed the characteristics of the affected HCWs, the pre-exposure protection (where applicable), the route of exposure, the source of infection and the post-exposure prophylaxis, where applicable.

Results

A review of the medical database of the National Institute of Infectious Diseases "Prof.Dr. Matei Balș" identified 60 healthcare workers with a mean age of 36±10 years, who reported an occupational exposure during the nine-year period of the study. Of these, 54 (90%) were females and 6 (10%) were males; 48 (80%) were nurses, 7 (12%) were doctors and 5 (8%) were medical assisting staff.

In 49 (82%) cases the exposure was percutaneous (injury with sharp devices most commonly during suturing, injections, or drawing venous blood) and in 11 (18%) of the cases the exposure was either mucosal or corneal (table 1).

Age ± standard deviation	36 ± 10 years		
Gender	Males	Females	Total
	6 (10%)	54 (90%)	60 (100%)
Occupation	Nurses	Doctors	Assisting staff
	48 (80%)	7 (12%)	5 (8%)
Exposure	Percutaneous	Mucosal/corneal	
	49 (82%)	11 (18%)	

Table 1. Age, gender, occupation and way of exposure of HCWs who reported an occupational exposure during the nine-year period of the study

Both HCWs and source patients were tested for viral markers: hepatitis B surface antigen (HBsAg), antibodies to hepatitis B surface antigen (anti-HBs), antibodies to hepatitis C virus (anti-HCV), and antibodies to HIV. An analysis of the serological status of the source is presented in figure 1.

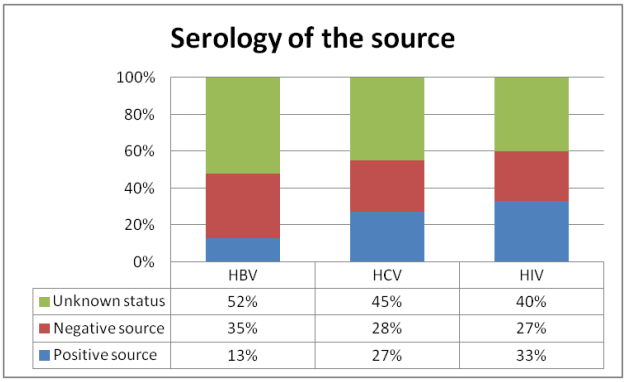

Figure 1. Serological status of the source

In 8 cases (13%) the source was an HBV positive patient, in 16 cases (27%) the source was an HCV positive patient, in 20 cases (33%) the source was an HIV positive patient. These numbers include coinfections, as follows: in 1 case (1.7%) the source was co-infected with HBV, HCV and HIV, in 2 cases (3.3%) the source had HBV, HIV co-infection and in another 2 cases (3.3%) the source had HCV, HIV co-infection.

Analyzing the protection of HCWs for HBV (figure 2), we identified 10 (17%) exposed HCWs with an insufficient level of antibody (HBsAb) response (below 10 mIU/mL), who were considered unprotected, 6 (10%) had titers between 11 and 500 mIU/mL indicating low protection, while 31 (52%) were considered sufficiently protected (501-1000 mIU/mL), and 13 (21%) of the tested HCWs had very high levels of anti-HBs (>1000 mIU/mL).

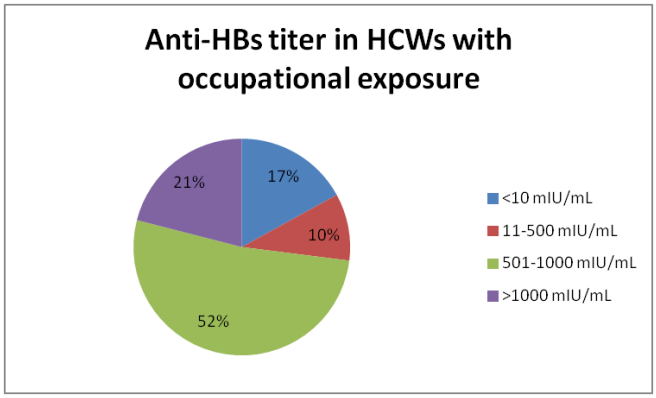

Figure 2. Anti-HBs titer in HCWs with occupational exposure to potentially contaminated blood or bodily fluids.

PEP for HBV, HCV and/or HIV was administered according to the status of the source of infection: PEP for HBV in 12% of cases, PEP for HCV in 26% of the cases and PEP for HIV in 60% of the cases. These numbers include HCWs exposed to more than one agent (virus), e.g., 1 case (1.7%) got treatment for all three viruses (HBV, HCV and HIV), 4 (6.7%) got treatment for HBV and HCV, and 3 (5%) got treatment for HCV and HIV. PEP was not administered in 5% of cases, and treatment was not documented in 10% of the cases.

All HCWs who reported an occupational exposure to a blood-borne infection were tested at the day of the event and were followed at least once during the first year (typically at 1.5, 3 and 6 months) – "short term follow up" and after 12 months and more – "long term follow up". At short term and long term follow up, 100% of the HCWs with documented occupational exposure were found negative for HBV, HCV and HIV.

Discussion

The exposure event analysis in this research corresponds with similar analyses reported in field literature. Among HCWs, nurses reported the most frequent exposures (80%), with percutaneous injuries ranking highest.

A large percentage of patients received PEP, which appeared to contribute to the negative resulta of HBV, HCV and HIV tests over the course of short term and long term follow-up. The small number of cases and the relatively small risk of infection prevented us from calculating an exact efficiency of the PEP treatment.

Factors which appeared to contribute to treatment success included: the availability of treatment, the prompt commencement of treatment, and of course, the medical background of the HCWs, who were familiar with the protocols for post-exposure care.

The pre-exposure protection from HBV is reflected by the level of anti-HBs at the day of exposure event, level which also serves in calculating the level of post-exposure prophylaxis treatment (one to three doses of post-exposure vaccines). We found that 17% of the HCWs did not display sufficient protection against HBV (being either negative to anti-HBs, or with titers below 10 mIU/mL). Similar data are available for Bosnia and Herzegovina, where 20.59% of HCWs had anti-HBs titers above 10 mIU/mL five years after vaccination[22] and for Israel, where 13.5% of vaccinated hospital employees had titers of anti-HBs below 10 mIU/mL, while titers over 1000 mIU/mL were identified in 18.9% of HCWs[23] (compared to 21% in our study).

An efficient booster-vaccination program could reduce this percentage of HCWs who are considered not protected according to the current definition. Still, despite the relatively high percentage of patients with insufficient levels of anti-HBs, the fact that none of the exposed HCWs included in this study acquired HBV infection may point to a mechanism of cellular protection, apart from the already well-described antibody protection.

Minimizing the risks of HCWs to acquire blood-borne pathogens, together with correct and rapid post-exposure prophylaxis treatment when needed, should be an integral part of infection control and occupational health programs in all healthcare facilities.

Conflicts of interest All authors – none to declare.

Author contributions EM gathered the study data, analyzed the data and wrote the manuscript. DP supervised the epidemiologic interpretation of the data. RB provided the data for the study.

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