

# OCCUPATIONAL EXPOSURE TO BIOLOGICAL PRODUCTS OF HEALTH PERSONNEL IN AN EMERGENCY COUNTY HOSPITAL

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**Keywords:** exposure to body fluids, personnel's health, occupational exposure

**Abstract:** Clinical staff has a high risk of infection with various blood-borne pathogens. We performed a retrospective study in an emergency county hospital over the period 01/01/2010 – 31/12/2010 to identify the incidence of the accidents by exposure to blood and body fluids (EBA) of the personnel and the characteristics of these exposures. From 1505 employees – medical staff – a number of 58 people said that they had an accident by exposure to body fluids; their highest incidence was registered at the medical specialists. The percutaneous exposure, through puncture or cutting, was presented in 93% cases of the injured ones, 7% of exposures were hepatitis B and C and in 10% of cases occurred with the unknown needle. None of the EBA cases monitored serologically showed viral serological-conversion.

**Cuvinte cheie:** expunere la lichide biologice, sănătatea personalului, expunere ocupațională

**Rezumat:** Personalul sanitar prezintă un risc important de infectare cu diverși agenți patogeni transmiși prin sânge. Am realizat un studiu retrospectiv într-un spital clinic județean de urgență în perioada 01.01.2010-31.12.2010 pentru a identifica incidența accidentelor prin expunere la sânge și lichide biologice (EBA) produse la personalul angajat, precum și caracteristicile acestor expuneri. Din 1505 angajați -personal sanitar- un număr de 58 de persoane au declarat că au avut un accident prin expunere la lichide biologice; cea mai mare incidență a acestora s-a înregistrat la medicii specialiști. Expunerea percutană, prin înțepare sau tăiere a fost prezentă la 93% dintre cei accidentați, 7% dintre expuneri au fost la virusurile hepatitice B și C, iar în 10% din cazuri înțeparea s-a produs în necunoscut. Nici unul din cazurile de EBA supravegheate serologic nu a prezentat seroconversie virală.

## INTRODUCTION

The employees from hospitals have a substantial risk of acquiring serious infections with various blood-borne pathogens due to frequent exposure to biological fluids of the patients they take care. These risks have been overlooked or underestimated for a significant period of time and professionals themselves have refused to concern with these issues, believing that they are inherent risks in the profession. The annual incidence of these accidents is estimated to be about 3.5% at workers (1) and 37% of the infections with hepatitis B virus, 3% with hepatitis C virus and 4% with HIV at the employees from the hospitals due to the occupational exposure (2).

During the recent years, EBA monitoring has been improved and the reporting from the hospitals about the occupational exposure to public health departments became mandatory since 2006 (OMSF 916/2006).

## OBJECTIVE

The study sought to determine the incidence of EBA cases and to identify the characteristics of these exposures in an emergency county hospital with a number of 1160 beds and continuous hospitalization, unit where 1745 employees work.

## MATERIAL AND METHODS

We performed a retrospective study of prevalence at Emergency County Hospital from Sibiu over a period of one calendar year, during 01.01.2010-31.12. 2010; since 2006, there are provided a comprehensive monitoring protocol of

surveillance, advisory activities and evaluation of these accidents together with the virology laboratory.

The accident by exposure to blood (EBA) (whole blood, plasma, serum, human blood components, etc...) was defined as any accidental exposure (percutaneous-stick injury, cutting, spraying the mucosa or skin lesions contiguity) to blood, to a body fluid contaminated with blood or to other fluid that may contain blood-borne pathogens (amniotic fluid, CSF, synovial, pericardial, pleural, peritoneal fluid).

The study group was represented by staff of this hospital, who has suffered during that time of EBA, the incident being declared and taken out at the level of the Department of Supervision and Control of Nosocomial Infections; the needed information have been extracted from the sheet - type of surveillance of EBA from healthcare professionals. In this data sheet were noted data related to injured person - age, period of employment, the vaccinations history, timing and circumstances of the accident, type of exposure (puncture, cutting, spraying blood, etc.), the application of the universal precautions before the accident, the information about the source-patient of the accident, especially its viral serological status; the measures taken after the occurrence of EBA, the result of serological tests taken after the accident and whether it was or not needed the prophylactic therapy (anti-HIV or anti HBV) and/or serological surveillance for six months after the time of the occurrence of the EBA.

There have been used Excel Program. These data were exported in the Medcalc Program, which was used for statistical

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Article received on 28.05.2011 and acceptat for publication on 24.10.2011  
ACTA MEDICA TRANSILVANICA December 2011; 2(4)187-190

processing; the graphics were made both in Excel and in Medcalc.

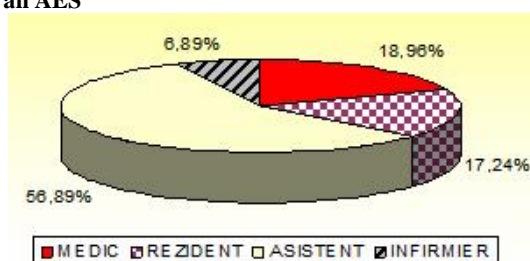
**RESULTS**

The period we referred to, a total of 1745 persons, of which 1505 was the medical staff have worked in the hospital.

A total of 58 employees had an episode of the EBA, which represents an incidence of 3.32% of the total employment and 3.85% of the total health personnel; there were no recorded accidents at other staff (stretcher bearers, TESA personnel, workers, etc...).

In terms of frequency of the categories of the medical staff who has suffered an EBA, the distribution is represented in Fig. no. 1: nurses 56.89%, doctors 18.96%, resident doctors 17.24% and hospital attendants 6.89%.

**Figure no. 1. The frequency of the medical staff that have had an AES**



The EBA incidence of health staff is presented in Table no. 1. Although EBA incidence at doctors is higher than the rest of the medical staff, there is no statistically significant difference in this aspect (chi square test  $P = 0.2133$ , Table no. 2).

**Table no. 1. EBA Incidence of Health Staff**

Personnel Category	Absolute Frequency from Total Health Staff (no. of persons)	Absolute Frequency AES (no. of cases)	AES Incidence
Doctors	192	11	5,72%
Resident doctors	231	10	4,32%
Nurses	775	33	4,25%
Hospital attendant/caretakers	307	4	1,30%
Total health staff	1505	58	3,85%

**Table no. 2. Statistical analysis regarding the EBA number at specialists and at the rest of the health staff**

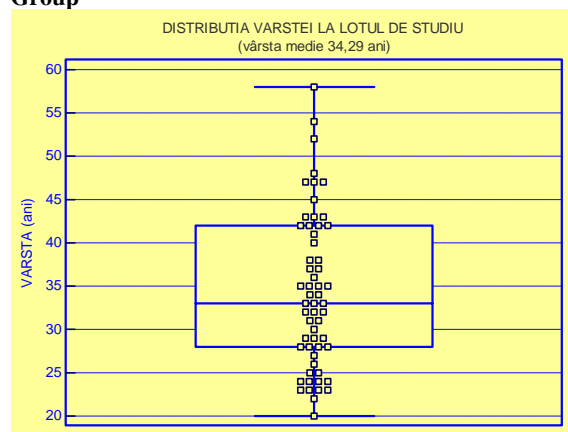
Total health employees N=1505	AES	
	present	Absent
No. of specialists N=192	11	181
Nr. health staff (without specialists) N=1313	47	1266
Chi-square = 1,549		
$P = 0,2133$		
Contingence coefficient. = 0,032		

The incidence calculated by dividing the total number of cases at the average number of hospital beds occupied in 2010 (1098 beds) was **5.28%**.

The average age of people who have had an EBA was  $34.29 \pm 8.91$  years, with interval limits of 20 and 58 years (fig. no. 2).

Seniority at the workplace at the people injured varied between 1 and 27 years (median - 4 years, table no. 3); the distribution of the cases by age is presented in Fig. no. 3.

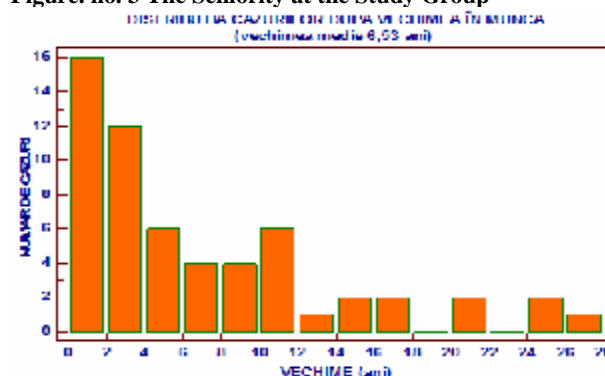
**Figure. no. 2. The Distribution of the Age at the Study Group**



**Table no. 3. The Characteristics of the Seniority at the Workplace at the Study Group**

Variable	SENIORITY
The size of the group	58
The lowest value	1,0000
The highest values	27,0000
Median	4,0000
95% CI for median	2,0000 la 6,7840

**Figure. no. 3 The Seniority at the Study Group**



Over **58%** of the injured people had the work experience less than 6 years; only **27.5%** of EBA people had over 10 years experience at the workplace. Among those who have suffered such exposure, 74.10% were female and 25.86% men.

Most of the healthcare workers who suffered an EBA were fully vaccinated against hepatitis B virus (Table no.4).

Of the 45 fully vaccinated people, a number of 36 (80%) had a titre of atc anti HBs at satisfactory titre (i.e. more than 10 mIU / ml, as recommended by OMS) (Fig. No. 4)

From the total number of accidents, over two-thirds occurred in the morning shift (fig. no. 5); regardless the shift work, about 70% of EBA occurred within the first 6 hours of work.

31 of the accidents (about 53%) occurred in emergency situations, the rest were the result of routine gestures.

Regarding the nature of exposure, 49 EBA (84.48%) were produced by stick, 5 by cutting (8.62%) and the remaining 4 (6.9%) were accidental splashing of mucous membranes. Of the 49 EBA, 29 occurred during performance of these treatments, 20 were subsequently produced either by re-hooding of the needles or in the moment of the evacuation of the incorrectly collected stinging wastes (table no. 5).

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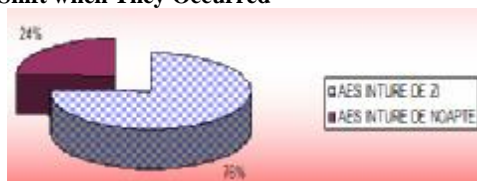
**Table no. 4. The Absolute Frequency of the Vaccinated Persons who Suffered an EBA**

NON-Vaccinated		Vaccinated - 3 doses		Vaccinated 2 doses		Vaccinated 1 dose		Unknown	
%	Absolute frequency	%	Absolute frequency	%	Absolute frequency	%	Absolute frequency	%	Absolute frequency
15,5	9	77,6	45	5,17	3	0	0	1,72	1

**Figure no. 4. The Repartition of the Fully Vaccinated Personnel from Protection in Antibodies anti HBSs Point of View**



**Figure no. 5 The Proportion of the EBA Cases after the Work Shift when They Occurred**



**Table no. 5 The Type of Exposure in EBA Case through Stinging**

TOTAL EBA THROUGH STINGING					
49 CASES					
Stinging during the therapeutic handling/operatory act				Stinging after the end of the therapeutic handling/operatory act	
29 CASES				20 CASES	
Injectio N I.M.	Punctio n I.V.	Injecti on S.C. OR I.D.	Stingi ng in suture needl e	Stingi ng during the re- hooding of the needles	Stingi ng during the evacuation of the incorrectly collected stinging wastes
4	13	4	8	7	13

Of the 54 EBA cases occurred by stick and cutting, the injured personnel respected the universal precautions by wearing gloves at a rate of 68.5% (37 people), the remaining of 31.5% (17 persons) did not wear gloves at the time of the AES.

Over half of the EBA cases occurred in the salons of patients (53.44%); the rest occurred in the operating rooms (20.7%), the ATI rooms, treatment rooms etc. (Fig. no. 6).

At 52 from 58 cases, the source was known, while in six cases, the accident occurred through stinging in the unknown needle stick. All the cases with identified source patient were explored with the virology lab for testing the infections with HCV, HBV and HIV, noticing that most of them were negative; however 6.9% of them were found to be carriers of hepatitis C virus (3 persons) or hepatitis B (one person)(table no. 6).

Serological surveillance after the occurrence of EBA was indicated in 12 cases (20.68%), being imposed by either the unknown needle stinging or exposure to a source patient positive viral serology or with various risk factors (blood transfusions in the last six months, chronic dialysis, etc.). (fig. no. 7). There was no viral serological-conversion to any of the injured persons who were taken care.

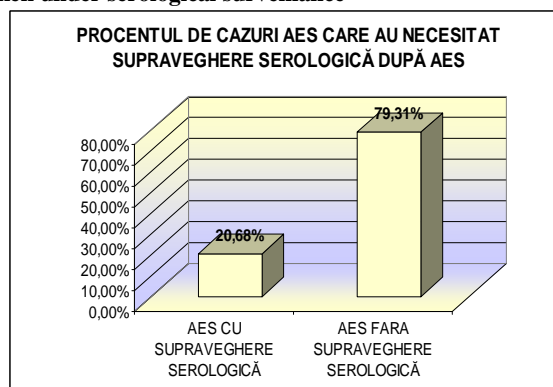
**Table no. 6. Number of EBA Cases with Known and Unknown Source**

total cases AES: 58				
AES with known source				AES with unknown source
52				
HIV+ source	HCV+ source	HBV + source	source with negative serology	
0	3	1	48	6

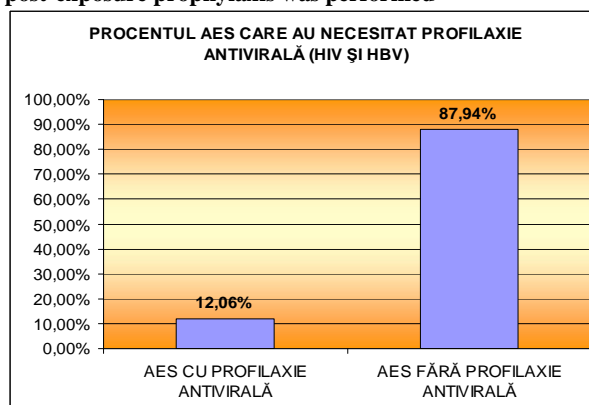
**Figure no. 6. Workplaces where EBA occurred**



**Figure. no. 7 The Frequency of the EBA cases which were taken under serological surveillance**



**Figure no. 8 The frequency of the EBA cases at which the post-exposure prophylaxis was performed**



There have been performed post-exposure prophylaxes at 12, 06% from the cases, from a total of 58 EBA cases (fig.no.8).

The post-exposure prophylaxis anti HIV was performed in 4 cases (6.9% of all recorded accidents) (for the cases puncture in unknown needle, declared according to the protocol EBA in a specific time to justify the beginning of the chemo-prophylaxis) and the prophylaxis of the infection with HBV was performed in three of the cases (5.17%), where the titre of post vaccine antibodies was insufficiently or the injured person has not been vaccinated, while the exposure was at risk for contacting this infection.

### DISCUSSIONS

In this study, 58 persons, i.e. 3, 32% - hospital employees and 3, 85% - medical staff were exposed to biological products during a year. This incidence rate is similar to that reported by other authors (1, 3); other studies show rates of EBA which are ranging: Saudi Arabia: 0.11 / nurse / year and 0.06 / doctor / year (4); another study conducted in Singapore (5) showed rates of exposure to medical personnel of 7.5% per year (11% at doctors and 6,9% at nurses); a study from Denmark (6): rates of 0,093 at doctors and 0,068 at nurses.

In the retrospective studies, as the presented one, the incidence rate depends largely on voluntary reporting of these events in specialized structures of oversight that is why, in the surveys which use the method "face to face", the prevalence is much higher.

The staff with less work experience (under 6 years) is at higher risk of being exposed than the staff with bigger experience; and here, however, comes the reporting compliance of these events: young staff, new employee is trained in this field and willing to comply with reporting and monitoring protocol, compared with older staff, which, often, the stinging, cutting or accidental spillage are seen as inherent risks at the workplace.

In this study, the highest rate of occupational exposure reported to the number of employees, was at the specialist doctors (5.72%), followed by the residents (4.32%) and nurses (4.25%), even though in absolute terms the highest number of EBA cases was registered at nurses (33 of 58 cases). This higher rate of exposure at doctors than nurses or auxiliary staff was noted in other studies (5, 6), but we have not found statistically significant differences between the number of EBA at doctors and the number of EBA at the rest of medical staff ( $P = 0.233$ ).

Of the total exposed personnel, over 77% were fully vaccinated against hepatitis B virus; however, only 20% had no protective antibody at a satisfactory level (above 10mUI/ml).

Over 84% of EBA occurred with punctures in unknown needles; only 60% of them occurred during the actual care activities, the remaining of 40% were the results of not taking care in respecting some rules which forbid the re-hooding of the needles or standards which are related to the proper stinging wastes collection. Only 61% of the personnel exposed to EBA wore gloves in the moment of the accident, being known that the stinging through the glove reduces the potential risk of infection by reducing the volume of inoculated blood with 50% in the case of a suture needle and 30 - 50% in the case of a blood sampling needle (7).

More than 50% of accidents occurred inside the patients rooms, at the administering of the treatment at bed; secondly, EBA occurred in the surgery rooms (approx. 20%).

Over 20% of injured personnel required further serological surveillance because of several reasons: either the punctures occurred with unknown needles (10.34% of EBA) or

source patients were positive to one of the studied viruses (HBV or HCV-6.9%, no patient being HIV positive) or they had risk factors which justified the surveillance. The post-exposure prophylaxis was required at 12% of those injured, according to the specific protocol.

### CONCLUSIONS

1. Accident by exposure to biological products of health professionals is a reality that must preoccupy experts in the field; the annual incidence, according to this study, is of 3.85% from all health personnel employed in an emergency county hospital. Compared to the average number of occupied beds per year, the EBA incidence was 5.28%.
2. The higher medical personnel (specialist doctors and residents) pointed out a higher incidence rate of the accidents by exposure to body fluids than the average and auxiliary staff.
3. In this study, the greatest risk of transmission has been linked to hepatitis C virus infection and hepatitis B, almost 7% of patients being infected with this source. During the studied year, there was no viral serological-conversion to either of those exposed.
4. It is necessary to update the knowledge and to respect the universal precautions, in order to reduce the risk of transmission of viral infections to the staff; approx. 1/3 of the accidents were not properly protected at the time of EBA.
5. Only 77% of injured personnel were completely vaccinated against HBV, and the protection of the antibodies lacked at 20% of them; the increased number of vaccines at the personnel and the periodic control of the protection conferred by the vaccine during the activity of the health surveillance at work, are objectives which require to be met by the employer.

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