

©Borgis

\*Joanna Krzowska-Firyeh<sup>1</sup>, Agata Kozłowska<sup>1</sup>, Justyna Stempkowska<sup>1</sup>, Karolina Snopek<sup>2</sup>, Benjamin Khan<sup>2</sup>, Joanna Smelcerz<sup>2</sup>

## Occupational exposure to blood and body fluids among health care workers in Lublin province (eastern Poland) in 2011-2012

## Ekspozycja zawodowa na krew i płyny ustrojowe wśród pracowników służby zdrowia w Lublinie w latach 2011-2012

<sup>1</sup>Department of Infectious Diseases, Medical University, Lublin  
Head of Department: Krzysztof Tomasiewicz, MD, PhD<sup>2</sup>Clinical Research Association for Infectious Diseases (CRAID), Department of Infectious Diseases, Medical University, Lublin  
CRAID Coordinator: Joanna Krzowska-Firyeh, MD, PhD**Key words**

occupational exposure, post-exposure prophylaxis, health care workers, blood borne infections

**Słowa kluczowe**

ekspozycja zawodowa, profilaktyka poekspozycyjna, pracownicy służby zdrowia, zakażenia krwiopochodne

**S u m m a r y****Introduction.** Occupational exposure to blood and body fluids among HCWs constitutes a significant risk of transmission of hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV).**Aim.** The aim of this study was to estimate the number, occupation, type of the exposure and the efficacy of PEP among HCWs exposed to blood or body fluids consulted at the Dispensary of Occupational Post-Exposure Prophylaxis of Diseases Transmitted With Blood in the Department of Infectious Diseases, Medical University of Lublin, Poland in 2011-2012.**Material and methods.** We have retrospectively analyzed medical records from years 2011-2012 of all HCWs occupationally exposed to blood or body fluids consulted at the Dispensary of Occupational Post-Exposure Prophylaxis of Diseases Transmitted With Blood in the Department of Infectious Diseases, Medical University of Lublin, Poland.**Results.** Since 2011-2012 206 exposed HCWs were consulted. There were 44.7% nurses. In 144 (69.9%) HCWs needlestick injury was noted. The serology of source persons blood revealed HCV antibody in 18 persons, HBs antigen in 11 and HIV antibodies in 5 people respectively. Infection caused by blood borne pathogens was not observed in exposed HCWs.**Conclusions.** Needlestick injury was the most common form of exposure. The biggest group of HCWs reported exposures were nurses. Most HCWs were exposed to HCV than to HBV. PEP was successful in all exposed HCWs.**S t r e s z c z e n i e****Wstęp.** Ekspozycja zawodowa pracowników ochrony zdrowia na krew i inny potencjalnie infekcyjny materiał stwarza istotne ryzyko zakażeń wywołanych przez wirusy zapalenia wątroby typu B (HBV) i typu C (HCV) oraz wirus nabytego niedoboru odporności (HIV).**Cel pracy.** Celem pracy była ocena ilości i rodzaju ekspozycji z uwzględnieniem grup zawodowych wśród pracowników ochrony zdrowia, którzy ulegli ekspozycji zawodowej w latach 2011-2012 i byli konsultowani w Poradni Profilaktyki Poekspozycyjnej w Lublinie. Analizie poddano również skuteczność profilaktyki poekspozycyjnej u osób ekspozycyjnych na HBV, HCV czy HIV.**Materiał i metody.** Dane uzyskano poprzez retrospektywną analizę dokumentacji medycznej pracowników ochrony zdrowia, którzy po ekspozycji zawodowej byli konsultowani w Poradni Profilaktyki Poekspozycyjnej przy Katedrze i Klinice Chorób Zakaźnych UM w Lublinie w latach 2011-2012.**Wyniki.** W latach 2011-2012 ogółem konsultowano 206 pracowników ochrony zdrowia, którzy ulegli ekspozycji zawodowej. W tej grupie 44,7% stanowiły pielęgniarki. U 144 (69,9%) osób doszło do zakłucia igłą. Badania krwi osób będących źródłem zakażenia wykazały obecność przeciwciał anti-HCV u 18 osób, antygenu HBs u 11 i przeciwciał anti-HIV u 5 osób. U żadnego pracownika po ekspozycji zawodowej nie doszło do zakażenia.**Address/adres:**\*Joanna Krzowska-Firyeh  
Department of Infectious Diseases  
Medical University  
ul. Staszica 16, 20-081 Lublin  
tel: +48 (81) 534-94-14  
firyehjdr@poczta.onet.pl

**Wnioski.** Zakłucie igłą stanowiło najczęstszą postać ekspozycji w badanej grupie. Największą liczbę ekspozycji odnotowano wśród pielęgniarek. Badania krwi osób będących źródłem zakażenia wykazały, że ekspozycje na HCV są częstsze niż na HBV. Profilaktyka poekspozycyjna była skuteczna u wszystkich eksponowanych osób.

## INTRODUCTION

Occupational exposure to blood or body fluids among health care workers (HCWs) constitutes a significant risk of transmission of blood borne pathogens (BBP). These exposures can lead to infection with hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). Blood borne pathogens may be transmitted through percutaneous or mucocutaneous exposure to body fluids especially via needlestick injuries (NSIs) and splash injuries (1).

It is estimated that more than 3 million health care workers worldwide experience percutaneous exposure to blood pathogens each year, resulting in approximately 1000 HIV, 66 000 HBV and 16 000 HCV new infections annually. The risk of transmission of HBV infection by a needlestick injury is between 6 and 30% for susceptible HCWs, without post-exposure prophylaxis (PEP). The transmission rate of HCV is estimated between 1 and 10%. The risk of HIV infection from a positive source is estimated to be 0.3% from a single percutaneous exposure and 0.09% from mucous membrane exposure (2). According to World Health Report 2002, 2.5% of HIV cases among HCWs and 40% of hepatitis B and C cases among HCWs worldwide are the result of occupational exposure (3). Among health care workers seroprevalence of HBV is two to four times higher than in general population (4).

Needlestick injuries of HCWs are an important occupational hazard leading to infections with BBP and unsafe practices can increase the potential risk of occupational transmission (5).

Prevention of blood exposure accidents involves safe working procedures. Strategies are available to prevent infections including education of HCWs and reduction of invasive procedures (6).

In HCWs exposed to BBP the potential for transmitting HBV, HCV and HIV should be evaluated. The source patient's serostatus for antibodies against HCV, HIV and HBsAg should be obtained. In exposed person baseline HBV, HCV and HIV immune status should be available (7). If the source patient is HBsAg-positive PEP is not recommended in previously vaccinated HCWs with known antibody response. In other HCWs PEP with HBV vaccine, hepatitis immunoglobulin or both must be started as soon as possible. In HCWs exposed to viremic HCV source patients monthly monitoring of alanine aminotransferase activity and anti-HCV antibodies at month six is recommended. Following occupational exposure with potential for HIV transmission, use of antiretroviral PEP should be evaluated based on the route of exposure, the material involved and evaluation of the source patient (8).

## AIM

The aim of this study was to estimate the number, occupation, type of the exposure and the efficacy of PEP among HCWs exposed to blood or body fluids consulted at the Dispensary of Occupational Post-Exposure Prophylaxis of Diseases Transmitted With Blood in the Department of Infectious Diseases, Medical University of Lublin, Poland in 2011-2012. To assess the data a retrospective survey was undertaken.

## MATERIAL AND METHODS

We have retrospectively analyzed medical records from years 2011-2012 of all HCWs occupationally exposed to blood or body fluids consulted at the Dispensary of Occupational Post-Exposure Prophylaxis of Diseases Transmitted With Blood in the Department of Infectious Diseases, Medical University of Lublin, Poland.

## RESULTS

Since 2011 to 2012, 206 HCWs exposed to blood or body fluids were consulted at the Dispensary of Occupational Post-Exposure Prophylaxis of Diseases Transmitted with Blood in the Department of Infectious Diseases, MU of Lublin to evaluate the risk of HBV, HCV and HIV infection and to initiate PEP. In all exposed health care workers hepatitis B surface antigen (HBsAg), antibodies to HCV (anti-HCV) and antibodies to HIV were assessed on admission and in vaccinated HCWs the titer of HBs antibodies was measured. Blood from source patients was tested for HBs antigen, antibodies to HCV, and antibodies to HIV.

The study population consisted of 206 HCWs. Among them 67 were exposed in 2011 and 139 in 2012. There were 164 women (55 in 2011 and 109 in 2012) and 42 men (12 in 2011 and 30 in 2012). The mean age was 40 years, ranging from 22-62 years.

There were 92 nurses (44.7%), 30 physicians (14.6%), 24 dental students (11.7%), 20 cleaning staff (9.7%), 10 paramedics (4.8%), 8 dentists (3.9%), 8 laboratory technicians (3.9%), 7 paramedic students (3.4%), 4 medical students (1.9%), 2 dentist assistants (0.94%), and 1 nursing student (0.47%) (tab. 1). One hundred forty four (69.9%) health care workers reported needlestick injury (70% from HCWs consulted in 2011, and 69.8% in 2012). In this group were 83 nurses (32 in 2011, and 51 in 2012), 20 cleaning staff (4 in 2011, and 16 in 2012), 17 dental students (4 in 2011, and 13 in 2012), 10 physicians (1 in 2011, and 9 in 2012), 7 paramedics (5 in 2011, and 2 in 2012), 4 medical students (1 in 2011, and 3 in 2012), and 3 paramedic students (2012). Percutaneous injuries with sharp objects were observed in 46 (32.3%) health care workers (13 in 2011, and 33 in 2012).

This group consisted of 15 physicians (3 in 2011, and 12 in 2012), 8 dentists (2 in 2011, and 6 in 2012), 8 lab assistants (2 in 2011, and 6 in 2012), 7 dental students (3 in 2011, and 4 in 2012), 5 nurses (2 in 2011, and 3 in 2012), 2 dental assistants (1 in 2011, and 1 in 2012), and 1 nurse student in 2012. The incidence of accidental exposures to blood and body fluids of mucous membranes was 4.8%. In the study population accidental splashes of mucous membranes were reported in 10 HCWs (3 in 2011, and 7 in 2012). In this group were 4 physicians (1 in 2011, and 3 in 2012), 3 nurses (2 in 2011, and 1 in 2012), 2 paramedics and 1 paramedic student in 2012. In 6 (2.9%) HCWs splashes of skin were noted (4 in 2011, and 2 in 2012). In this group were 3 paramedic students (in 2012), 1 nurse in 2012, and 1 paramedic and 1 physician in 2011 (tab. 2).

**Table 1.** The frequency of exposures by occupational groups.

Job category	Number of exposed in 2011	% 2011	Number of exposed in 2012	% 2012	Total N	%
Nurses	37	55	55	39.6	92	44.7
Physicians	5	7.5	25	18	30	14.6
Dental students	7	10.5	17	12.2	24	11.7
Dentists	2	3	6	4.3	8	3.9
Paramedics	5	7.5	5	3.6	10	4.8
Paramedic students	3	4.5	4	2.9	7	3.4
Cleaning staff	4	6	16	11.5	20	9.7
Laboratory technicians	2	3	6	4.3	8	3.9
Medical students	1	1.5	3	2.2	4	1.9
Nursing students	0	–	1	0.7	1	0.47
Dental assistants	1	1.5	1	0.7	2	0.94
TOTAL	67	100	139	100	206	100

**Table 2.** The frequency of exposure by category.

Category of exposure	Total numbers in 2011	%	Total numbers in 2012	%	Total 2011-2012	%
Needlestick injury	47	70	97	69.8	144	69.9
Injury with sharp objects	13	19.5	33	23.8	46	22.3
Mucous membranes splash	3	4.5	7	5	10	4.8
Skin splash	4	6	2	1.4	6	2.9
TOTAL	67	100	139	100	201	100

One hundred ninety seven (95.6%) health care workers exposed to blood and body fluids from the study group were vaccinated against HBV before exposure.

In the study group 18 (8.7%) HCWs were exposed to HCV, 11 (5.3%) to HBV, and 5 (2.4%) were exposed

to HIV. In 25 (12.1%) cases serological status of the source was unknown. For all of them and for HCWs exposed to HBV, HIV PEP was offered. Post-exposure prophylaxis was started in 39 (18.9%) health care workers. Two HCWs did not agree to start PEP. Thirty five HCWs exposed to infectious blood or body fluids completed the follow-up period and in all bloodborne infections were excluded (seroconversion was not observed).

## DISCUSSION

Injuries with needlestick or sharp instruments are common in routine activity of health care workers (5).

In Poland 37 000 stabbing incidents occur annually among health care workers, and the incidence most frequently are observed in nurses, physicians, laboratory technicians and in cleaning staff (9). Data from our study indicate that among 206 HCWs exposed to blood or body fluids in 190 persons (92% of all exposed) percutaneous injuries occurred. The needlestick were far more numerous than sharp injuries (144 and 46, respectively). Of all exposures 69.9% were needlestick, and 22.3% were injury caused by sharp objects. More than half (57.6%) of the HCWs who sustained needlestick injury during the study period were nursing staff. The data from our study indicate also that 44.7% of all cases of occupational blood and body fluids exposure accidents occur in nurses. Data presented by Krawczyk et al. indicate that among 93 HCWs exposed to BBF there were 63 nurses (10). This observation is in accordance with results from our study and reports from other countries (11, 12). By the estimates of Chen and Jenkins (13), nurses had the highest rate of exposures, followed by clinical laboratory technicians, and physicians. In contrast to other authors according to Wicker et al. physicians reported the most injuries (55.8%) followed by nurses (22.2%) (6). In our study among HCWs exposed to BBF 14.6% were physicians. The incidence of percutaneous injury among physicians was 17.4% and was lower than in studies from other countries (14).

Most episodes of mucous membranes exposures were observed in physicians than in nurses. This data is in accordance with results from other studies (14).

About 4% of all blood accidents in our study occurred in dental practices. Similar data was obtained from other studies (15).

The true number of NSIs sustained by HCWs is still unclear, primarily due to under-reporting. Data reported by Wicker et al. indicate that only 28.7% of injured HCWs reported all NSIs. Panlilio et al. found an under-reporting rate of 57% (6, 16). Despite a higher liability to injury, physicians are less likely to report injuries than nurses (17).

The splashes were less numerous, involving especially mucous membranes (4.8%) but also the skin (2.9%). The pattern of mucous membrane or skin exposure are slightly different from those observed for percutaneous exposure. Highest rates of mucous mem-

brane exposure was observed in physicians (1.9%) and most skin exposures occurred in paramedic students (1.4%).

Vaccination is one of the best ways to protect HCWs from HBV infections. In the present study the number of HCWs immunized with hepatitis B vaccine was almost 100% (95.6%) and was higher than data from other studies (6). PEP was successful in all HCWs exposed to infectious blood or body fluids and no cases of seroconversion after follow up were observed. This data indicate the importance of PEP and injury reporting among exposed HCWs.

## CONCLUSIONS

Data from our study indicate that among health care workers needlestick injuries were the most common type of exposure. It can be also concluded that nurses are the biggest group of HCWs reported exposures to blood and body fluids. The percentage of HCWs exposed to HVC was higher than exposed to HBV or HIV (8.7 vs. 5.3% and 2.4% respectively). It should be pointed that more than 90% of HCWs were vaccinated against HBV before exposure. Among all HCWs exposed to infectious blood or body fluids bloodborne infections was not observed.

## BIBLIOGRAPHY

1. Beltrami EM, Williams IT, Shapiro CN, Chamberland ME: Risk and management of blood-borne infections in health care workers. *Clin Microbiol Rev* 2000; 13(3): 385-407.
2. Pruss-Ustun A, Rapiti E, Hutin Y: Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. *Am Journal of Industrial Medicine* 2005; 48: 482-490.
3. World Health Report: Reducing Risks, promoting healthy life. WHO, Geneva 2002.
4. Sepkowitz KA: Occupationally acquired infections in health care workers. Part 2. *Ann Intern Med* 1996; 125: 917-928.
5. Lee JM, Botteman MF, Xanthakos N, Nicklasson L: Needlestick injuries in the United States. Epidemiologic, economic and quality of life issues. *AAOHN J* 2005; 53: 117-133.
6. Wicker S, Jung J, Gottschalk RAR, Rabenau HF: Prevalence and prevention of needlestick injuries among health care workers in a German university hospital. *Int Arch Occup Environ Health* 2008; 81: 347-354.
7. Update: Universal precautions for prevention of transmission of human immunodeficiency virus, hepatitis B virus, and other bloodborne pathogens in health-care settings. *MMWR Morb Mortal Wkly Rep* 1988; 37: 87-88, 377-382.
8. Department of Health and Human Services CfDCaP: Updated US Public Health Service guidelines for the management of occupational exposure to HIV and recommendations for post exposure prophylaxis. *MMWR Morb Mortal Wkly Rep* 2005; 54: 1-17.
9. Goniewicz M, Włoszczak-Szubda A, Niemcewicz M et al.: Injuries caused by Sharp instruments among Healthcare Workers – international and Polish perspectives. *Ann Agric Environ Med* 2012; 19(3): 523-527.
10. Krawczyk P, Białkowska J, Dworniak D et al.: Is healthcare personnel the only professional group exposed to the risk of occupational HBV, HCV or HIV infections? *Med Pr* 2010; 61(1): 15-22.
11. Falagas ME, Karydis I, Kostogiannou I: Percutaneous exposure incidents of the health care personnel in a newly founded tertiary hospital: A prospective study. *PLoS ONE* 2007; 2(2): e194.
12. Foley M: Update on needlestick and sharp injuries: The needle stick safety and prevention act of 2000. *Am J Nursing* 2004; 104: 96.
13. Chen GX, Jenkins EL: Potential work-related bloodborne pathogen exposures by industry and occupation in the United States. Part I: An emergency department – based surveillance study. *Am J Ind Med* 2007; 50: 183-190.
14. Zhang M, Wang H, Miao J et al.: Occupational exposure to blood and body fluids among health care workers in a general hospital, China. *Am J Ind Med* 2008; 52: 89-98.
15. van Wijk PT, Schneeberger PM, Heimeriks K et al.: Occupational blood exposure accidents in the Netherlands. *European Journal of Public Health* 2009; 20(3): 281-287.
16. Panlilio AL, Orellien JG, Srivastava MS et al.: Estimate of the annual number of percutaneous injuries among hospital-based healthcare workers in the United States, 1997-1998. *Infect Control Hosp Epidemiol* 2004; 25: 556-562.
17. Elmiyeh B, Whitaker IS, James MJ et al.: Needle-stick injuries in the National Health Service: a culture of silence. *J R Soc Med* 2004; 97: 326-327.

received/otrzymano: 10.09.2014  
accepted/zaakceptowano: 14.10.2014