

# Prevalence of Hepatitis-B Surface Antigen (HBs-Ag) and anti-HCV Antibody Among Health Care Workers of Canton Sarajevo (Bosnia and Herzegovina)

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## ORIGINAL PAPER

### SUMMARY

In this article we studied the seroprevalence of hepatitis B virus (HBV), hepatitis C virus (HCV) with three serological markers (HBsAg, anti-HBsAg and anti-HCV) and correlate the prevalence with risk factors for exposure to and infection of healthcare workers (HCWs) in Sarajevo. The purpose of this study was to determine the immune status of HCWs against hepatitis B and C virus. Testing was done in Institute of Occupational Health of Canton Sarajevo using AxSYM MEIA assays (Abbott, Germany). HCWs were observed from October 2007 to May 2009. A total of 3,330 HCWs (54.0% nurses and laboratory technicians, 35.3% physicians and 10.7% others), aged between 21 and 61 years, were included in the study. The prevalence of HBsAg was 1.47% and anti-HBsAg was 27.02% among the HCWs, which was highest among nurses and laboratory technicians, following by doctors and other. The positive rates of HCV antibodies (anti-HCV) were 0.3%. Among the occupational factor, time in service contribute increase in the chance of having positive serology. This study signifies the need for heightened attention and preventive measures against the infection of the health care professionals by hepatitis B (HBV) and hepatitis C (HCV) virus. Health education highlighting occupational risk of HBV, accessibility of vaccine and mandatory vaccination of HSWs is recommended to increase HBV vaccine compliance among HCWs.

**Key Words:** Hepatitis B, Hepatitis C, Health Care Workers, Occupational Risk.

## 1. INTRODUCTION

In health care facilities there is a high occupational risk of contact with biological agents. Infection with hepatitis B virus (HBV) and hepatitis C virus (HCV) in occupationally exposed health care workers (HCWs health-care workers) should be accepted as a realistic possibility. A high prevalence of these infections in the general population, the large capacity of infectious virus and daily contact with biological fluids and potentially contaminated instruments are key risk factors for HCWs for the transfer of HBV and HCV infection. At the same time, it is also an important public health issue.

Health care workers are the main professional group with the greatest biological risk of infection with HBV and HCV, as compared to other professional groups that show an increased risk of infection with HBV and HCV (1). The risk of HBV infections among HCWs is four times higher than in the general population and depends on the prevalence of HBV infected patients, nature and frequency of contact with blood and body fluids, duration of employment and immunization status (2). Among health personnel, physicians, surgeons, dentists, nursing staff, laboratory technicians have the highest incidence of hepatitis and prevalence of HBsAg or anti-HBsAg markers, compared with other

occupational groups exposed to blood products (3).

The prevalence of HBV infection in the general population varies by country and region, in the EU and the U.S. amounts to 0.1-0.2% (low prevalence), 0.4-0.8% in Germany (4); Italy 0.5-5.6%, 3% in Mediterranean countries (medium prevalence), high prevalence of 10-15% in Asia and Africa. The annual incidence of HBV infection among HCWs is estimated to be 0.5-5.0% (5).

Hepatitis C virus has a high prevalence in the general population (2% in Mediterranean countries), and in some categories of patients even more (5.2% in surgical patients). Other countries have a lower prevalence in the general population (for Germany it is estimated 0.4-0.7%) (4). Exposure risk for HCV is estimated to be 1.8% (0-7%) (5). In HCWs prevalence of HCV infection, including surgeons, is not higher than in the general population, approximately 1-2%, and 10 times lower than HBV infection (6).

Accidental needle stick injury bears the greatest and the most common risk for HCWs in the transfer of HBV and HCV infection. Risk factors for transmission of blood-borne viruses in HCWs are constantly increasing. It is estimated that every year occurs approximately 66,000 HBV and 16,000 infected HCWs in the world as a result of occupational exposure (5). For Bosnia and Herzegovina

Profession		Number of participants			Serological markers		
		HBsAg	%	anti-HBsAg	%	anti-HCV	%
Year of observation	2007	802	7	0.8	166	20.60	0
nurses, lab. technicians		421	6	0.7	52	6.40	0
physicians		213	1	0.1	24	2.90	0
other		168	0	0	18	2.2	0
Year of observation	2008	1910	38	1.90	663	34.7	9
nurses, lab. technicians		985	18	0.9	396	20.70	5
physicians		593	9	0.4	211	11.04	3
other		332	11	0.5	56	2.9	1
Year of observation	2008	618	4	0.6	71	11.40	2
nurses, lab. technicians		395	3	0.4	31	5.01	0
physicians		198	0	0	26	4.20	2
other		25	1	0.1	14	2.26	0
Total		3.330	49	1.47	900	27.02	11

Table 1. Seroprevalence of HBV and HCV infection in HCWs in Sarajevo, considering serological markers.

it is estimated that the prevalence of HBV infection in the general population, is 2-7%, which is high rate compared to the neighboring countries (5). Information on professional risk groups, especially HCWs are insufficient and unclear, and the available data presented research at the local level of health facilities.

## 2. GOAL

The aim of this study was to determine the prevalence of HBV (HBsAg, anti-HBsAg) and HCV (anti-HCV) markers among health care workers in outpatient health facilities in Sarajevo, the analysis of HCWs who were vaccinated, evaluation of risk factors and determination of their epidemiological significance.

## 3. MATERIALS AND METHODS

**Study population:** Between October 2007 and May 2009 the survey of seroprevalence was conducted for HBV and HCV infection among HCWs in outpatient health care facilities in Sarajevo. The participants were tested anonymously for HBV and HCV, with prior notice and consent for testing. The proposed inclusion criteria was active involvement of respondents in their profession during past six months and the absence of symptoms of acute HBV and HCV; exclusion criteria were active state of disease. The parameters of studies included laboratory tests, HBsAg, anti-HBsAg and antibody to HCV (anti-HCV).

Occupational status, duration of employment, gender and age are included as additional variables. The study population was divided into groups, according to the type of profession: nurses and laboratory technicians; the duration of employment: 0-5, 6-10, 11-20, > 20, by sex: male, female, by age: 15-25, 26-35, 36-45 and 46-60.

**Laboratory methods:** Venous blood sample was taken from each respondent in accordance with universal standards. Each blood sample was tested for HBsAg (hepatitis B surface antigen), anti-HBs and anti-HCV (HCV antibody). Hepatitis B parameters were analyzed using AxSYM MEIA assays according to manufacturer's instructions (Abbott, Wiesbaden-Delkenheim, Germany) (HBsAg-AxSYM HBsAg) (Abbott AxSYM system AUSAB-MEIA). Hepatitis C specific antibodies were also tested using AxSYM MEIA

assay (Abbott). All tests were performed in the laboratory of the Institute of Occupational Health of Sarajevo Canton. Tested sample was considered to be HBV and anti-HCV positive when the serum was repeatedly reactive to HBsAg and HCV antibody by the same MEIA method. Positive serum samples were tested for the presence of HBV DNA and HCV RNA by reverse transcriptase-polymerase chain reaction using Roche AMPLICOR test (University Clinical Center Sarajevo).

**Statistical analysis:** Data were inputted and analyzed statistically using SPSS version 12.0.1. In descriptive analysis the compared variables are expressed in percentage (level of antigens and antibodies, occupation). Multivariable logistic regression analysis was done to adjust for the confounders. A p-value of <0.05 was considered as statistically significant.

## 4. RESULTS

In this study participated 3330 respondents who were tested during the period from October 2007 until May 2009. The prevalence of viral hepatitis B (HBsAg) and hepatitis C (anti-HCV) infections among HCWs is given in Table 1.

HBsAg was found in 49 respondents (1.49%) (3.330/49), and the presence of HBV markers anti-HBsAg was found in case of 27.2% (3.330/900). Serological tests (anti-HBsAg) results are the result of previous vaccination (Table 1) and appear in the percentage of 27.2% of all HCWs. The test results show a low frequency of HCV antibodies in HCWs of 0.3% (3.330/11) observed in outpatient health facilities in Sarajevo (Table 1).

Multivariate analysis (Table 2) shows that a statistically significant frequency of hepatitis markers of HBV and HCV infection is higher in female compared with male (OR=2.1, p=0.001) and greater significance of viral markers of HBV and HCV in a group of professional nurses and laboratory technicians (OR=1.45; p=0.01), compared with physicians.

Multivariate analysis also shows that HCWs in the age group of 36-45 years (OR=5.91, 95% CI=2:45 to 10:46) show significant frequency of positive findings of hepatitis markers HBV and HCV, compared with other age groups.

Duration of employment at workplaces in health care becomes statistically significant for respondents with >20 years of employment (OR=6.20, p=0.001) in terms of frequency

Characteristics	OR (CI 95%)	p-value
Duration of employment		
0-5	1.0	-
5-10	1.47 (0.54-4.13)	0.114
11-20	2.12 (0.89-10.67)	0.012
>20	6.20 (2.18-16.87)	0.001
Gender		
Female	2.1(0.45-8.54)	0.001
Male	1.0	-
Age (yr.)		
15-25	1.0	-
26-35	4.12(1.23-11.12)	0.213
36-45	5.91(2.45-10.46)	0.001
46-60	1.0	-
Profession		
nurses, lab. technicians	1.45 (0.65-9.53)	0.01
physicians	1.0	-
other	1.0	-

Table 2. Multivariate logistic comparison for duration of employment, gender and age in HCWs.

of positive findings of viral hepatitis B and C.

## 5. DISCUSSION AND CONCLUSION

Health Care Workers have the greatest possibility of infection with Hepatitis B and Hepatitis C virus, due to their occupational exposure. Carried studies of HBV seroprevalence markers in HCWs showed the association of risk and frequency of the disease: prevalence of HBsAg in HCWs in health care institutions of Sarajevo, in this study was determined at a level of 1.47%, which is a relatively low prevalence rate among HCWs and a lower level of prevalence of HBV in the general population of Bosnia and Herzegovina (2-7%) (13). Compared with the prevalence of HBsAg marker hospitals in Bosnia and Herzegovina (Tuzla University Clinical Center), found prevalence of HBsAg in outpatient facilities was lower by 50% (1.47/3.5%) (6). In similar studies prevalence of HBsAg positive HCWs was determined in the value of 0.8% (8), to a value of 1.9% (9), and high values of HBsAg positive HCWs 2.8-9.7% in a moderate endemic areas of HBV (10). HBsAg prevalence that was found in our study should be considered in light of the fact that the research is conducted in outpatient health care institutions, where is the lower degree of exposure of staff to infectious biological materials and infectious patients, including asymptomatic carriers of HBsAg in the general population.

The positive finding of HBsAg in the professional group of nurses and laboratory technicians (OR=1.45; p=0.01), compared to other professional groups in the study, suggests that medical laboratory technicians constitute a group with the greatest chance of being exposed to needle stick injury or other infectious body fluids from patients as a result of exposure and accidents during disposal of used syringes (11). Duration of employment is a possible risk factor for HVB and HCV infection in HCWs, with statistical significance p=0.001 and is comparable to other studies (12).

Established values of HBs antibodies in HCWs in this study at the level of 2.27% are the result of an organized immunization conducted in different health institutions.

Vaccination is one of the best methods of protection against blood-borne infections, along with the fact that until now is only available for HVB (4).

The absence of a large number of vaccinated HCWs should be sought in the lack of interest and lack of knowledge about the importance of adequate prevention by HBV vaccination. Efficacy of carried HBV vaccination is confirmed by the institutions (the American Health Inspection Services) with a confirmed decline in incidence of hepatitis B in HCW, as a result of implementation of recommended vaccines and protective measures (10). The need for a comprehensive vaccination of all HCWs should be a top priority in the future.

Test results show a low frequency of HCV antibody in HCWs in Sarajevo, at the level of 0.3%, which is in accordance with similar international studies, confirming the fact that the possibility of developing HCV infection in HCWs is 10 times smaller than the possible infection with HBV with an average exposure risk of 1.8% (5.6).

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