

# Seroepidemiology of hepatitis B virus markers among hospital health care workers

## *Analysis of certain potential risk factors*

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### ABSTRACT

**Objectives:** To determine, the prevalence of hepatitis B virus markers among hospital health care workers, to determine the influence of some risk factors on such prevalence and to outline the specific policies to tackle such problems among hospital health care workers.

**Methods:** Hepatitis B virus markers including hepatitis B surface antigen, anti-hepatitis B surface antigen and anti-hepatitis B core antigen were determined from sera samples collected from 459 hospital health care workers at different hospital departments. The prevalence of hepatitis B virus among these employees was correlated by a variety of risk factors such as gender, age, blood transfusion, and needle-stick and sharps injuries, and previous history of jaundice using logistic regression analyses.

**Results:** Of the hospital health care workers studied 143 (31%) of employees showed evidence of previous hepatitis B virus infection, including 17 (4%) carriers. The highest incidence was among those who were working at infectious diseases departments where 22 (43%) employees were found to be seropositive, followed by 26

(41%) employees from surgical departments. The risk factors, which were found to influence seropositivity, include age over 40 years old, needle-stick and sharps injuries and previous blood transfusion. Other factors such as gender, and previous history of jaundice were statistically insignificant.

**Conclusion:** The hepatitis B virus infection was high among the hospital health care workers studied. This was influenced by certain potential occupational risk factors. As there is emerging evidence that vaccination among health care workers was infective. Specific measures should be implemented to reduce such risk. These may include strict policies on sharps and considering any blood or other body fluids being a potential risk. Education, clinical advice and health insurance should be available for health care workers who are at a higher risk of contracting hepatitis B virus infection.

**Keywords:** Hepatitis B virus, hepatitis B markers, hospital health care workers, risk factors.

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**V**iral hepatitis has been recognized to be one of the most important health hazards all over the world. The prevalence of hepatitis B virus (HBV) infection varies greatly from one country to another and from different groups or regions of the same country.

Such prevalence was reported to be <0.5% in certain western countries and up to 14% in the far east.<sup>1</sup> In the Arabic speaking countries it varied from 4.5% among the Libyan population up to 10-20% in certain parts of Egypt and Saudi Arabia.<sup>2</sup> Specific

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risk groups are of great importance in the epidemiological profile of viral hepatitis. The incidence of hepatitis B is particularly high among those individuals whose habits, illness or occupations bring them into contact with infected blood, blood products or other body fluids such as saliva or semen.<sup>3</sup> Advances in modern techniques of detecting HBV have enabled us to identify and follow those who are at a higher risk of contracting HBV such as hospital personnel or drug addicts. Recent studies using polymerase chain reaction (PCR) have indicated that HBV infection could be transmitted from those who are proven to be Hepatitis B Surface Antigen (HBsAg) negative individuals using traditional techniques.<sup>2</sup> Furthermore, the emergence of newly identified HB viral variants who were found to be resistant to lamivudine and not easily prevented by the widely used recombinant viral vaccine, added more complexity and confusion.<sup>4</sup> Hence the need, to implement a firm strategy to combat such problems became inevitable. Health care workers are at greater risk of acquiring HBV during their practice. This occupational risk is eventually related to the instances of direct contact with blood and body fluids, in addition to the accidental and traumatic exposure in the hospital settings. Despite the existence of effective vaccines for HBV for the last 2 decades, the initial strategy for vaccination, which targeted the health care workers was ineffective.<sup>4,5</sup> Routes of contagion of HBV among health care workers are variable. Therefore, the determination of such routes and the influence of occupational risk factors are important. This study aimed to determine the prevalence of HBV markers among hospital health care workers and the potential risk factors which might influence the prevalence of HBV.

**Methods.** From January until December 1999, 459 hospital employees who worked in close contact with the hospitalized patients of Tripoli Central Hospital and Tripoli Medical Center (TMC) participated in this study. These include doctors (85), nurses (92), nursing assistants (90), technicians (82), supportive personnel (63), and other personnel (47). The age of the individuals studied ranged from 18 to 65 years old with male to female ratio of 1.6:1.0. Each participant gave a blood sample for serological tests and completed a questionnaire giving occupational and medical information. This included details on age, sex, and departments, past hepatitis, previous immunization with hepatitis B vaccines, and history of jaundice, blood transfusions, and previous operations. Sexual behavior and drug abuses were not investigated, as it is considered confidential in the society. Laboratory analyses were carried out at the blood bank department of the same hospital, and Department of Medical Microbiology, Faculty of Medicine. Each

**Table 1** - The prevalence of hepatitis B virus makers among hospital health care workers at different hospital departments.

Hospital Departments	Number examined	Sero-positive	Prevalence
Internal medicine	173	51	29.5
Infectious diseases	52	22	43.0
Surgery	64	26	41.0
Orthopedic	48	13	27.0
Trauma	79	20	25.0
Urology	29	7	24.0
Ear, Nose and Throat	14	4	29.0
<b>TOTAL</b>	<b>459</b>	<b>143</b>	<b>31.0</b>

serum sample was tested for antibodies to hepatitis B surface antigen (anti-HBs) and antibodies to hepatitis B core antigen (anti-HBc) using Enzyme Linked Immunosorbent Assay (ELISA) supplied by Boeringer Mannheim Immunodiagnosics (Germany). For statistical analysis, the dependent variable, serological status, was divided into 2 categories; A - individuals with positive marker - seropositive; B - those without any marker - seronegative. Association between the seropositivity and any risk factor was estimated as risk ratio, and their statistical significance was tested by the chi-square test ( $X^2$ ). In order to assess the influence of potential risk factors on the prevalence of HBV, a single variable analysis using logistic regression model was carried out and all predisposing factors were analyzed.<sup>6</sup>

**Results.** The ages of the 459 employees studied ranged from 18 to 65 years old. The largest group being between 30 to 45 years. Two hundred and seventy five of the participants were male and 184 (40%) were female. The studied employees were from different hospital departments as shown in Table 1. Overall prevalence of HBV markers among the employees was 31%. The highest prevalence was reported among those working at infectious disease departments where 22 (43%) individuals were seropositive followed by those working in general surgery (26 individuals (41%)) and then internal medicine (51 (29.5%)), ear, nose and throat, orthopedic, trauma, and urology as shown in Table 1. The frequency of HBV markers among the Hospital Health Care Workers (HCCW) is shown in Table 2. One hundred and forty three employees had evidence of HBV infection, 17 (4%) of them were carriers, 119 (26%) individuals were immune and only 7 of them (1.5%) were at the window stage. There was no statistical

**Table 2** - Frequency of hepatitis B markers among hospital health care workers studied.

Hepatitis B markers	No. of employees (%)	
Total number	459	(100)
Sero-negative	316	(69)
Sero-positive	143	(31)
*HBsAg + anti-HBc	17	(4)
** Anti-HBc	7	(1.5)
***Anti-HBs + Anti-HBc	119	(30)

\* Carrier state    \*\* Window stage    \*\*\* Immune  
 HBsAg - Hepatitis B surface antigen  
 anti-HBc - antibodies to hepatitis B core antigen  
 anti-HBs - antibodies to hepatitis B surface antigen

difference in the prevalence of HBV markers between the different hospital professions studied. An attempt was made to further clarify the possible risk factors that could contribute to the increase in prevalence of hepatitis B markers among the population studied. The association between each variable risk factor and seropositivity is summarized in Table 3. Significant risk factors were age, blood transfusion, needle and stick injury, though sex, and history of previous jaundice were not statistically linked with HBV seropositivity. Concerning vaccination, which is not mandatory in the Libyan HHCW, 52 (11%) of the employees studied were vaccinated against HBV and thus it did not influence the prevalence of HBV among HHCW studied ( $P>0.06$ ). Furthermore, only eight (2%) of HHCW were found to be previously operated on, but none of them had hepatitis B infection.

**Discussion.** Health care workers are particularly vulnerable to hepatitis B virus infection, analyses and detailed detective work on occupational and procedure points, which may increase the risk of HBV infection would be of great importance. Studies of outbreaks of certain hospital units, have demonstrated the diversity of transmission pathway in the occupational settings.<sup>6</sup> These studies have also established that HBV transmission from infected health care workers can occur but this is insignificant comparable to the risk of health care workers acquiring such infection from their patients.<sup>6,7</sup> In this study the prevalence of HBV infection among the hospital personnel studied ranged from 24 to 43%. The highest was among infectious disease and surgical departments, our findings on hospital employees are very similar to the other studies carried out in other countries.<sup>6,8</sup> Different studies concerning the prevalence of HBV infection among health care workers including the present one, reflect a trend of age-related seropositivity. We found that the markers of HBV in those who are aged over 40 was significantly higher than those who aged less than 40 years. This is in an agreement with other studies carried out by other investigators,<sup>7</sup> who showed that the incidence of HBV markers increased with age and duration of employment. This however, may reflect the higher risk of exposure in the corresponding age in the general population. Gender on the other hand was not an influential factor in our study. Other studies however, showed the same results while others found that males are more effected than females.<sup>2,7,8</sup> Although there is no clear explanation of such variation among these studies, the nature of the society being modest may make gender of little or no influence on the spread of HBV infection.

Sharps injuries have become one of the most important occupational injuries and routes of

**Table 3** - Association between single risk factors and Hepatitis B virus sero-positivity among hospital health care workers.

Potential risk factor	Hospital health care worker			Risk ratio <i>P</i> value	
	Category	Employees tested	% seropositive		
Gender	Male	275	32	1.1	NS*
	Female	184	29	1.0	
Age	>40 years	192	38	1.5	<0.06
	<40 years	267	26	1.0	
Blood transfusion	Yes	51	41	1.4	<0.06
	No	408	30	1.0	
Needle stick & sharp injuries	Yes	231	38	1.6	<0.06
	No	228	24	1.0	
History of previous jaundice	Yes	42	36	1.1	NS*
	No	417	31	1.0	

\* NS - not significant

contagion in health care workers. In this study we found that the high incidence of HBV was higher among those who experienced needle stick and sharps injuries during their practice. The risk ratio of HBV was 1.6:1 of those who had sharps injuries comparable to those who did not have such injuries, and a significant association with seropositivity was found when logistic regression analyses was applied. This is in accordance with other investigators who found sharps injuries were a major cause of hepatitis B, hepatitis C and human immune deficiency virus (HIV) in health care workers.<sup>9,10</sup>

Blood transfusion is a well-established method of transmission of HBV and it is well known that exposure to blood and blood products are a risk factor of such virus. Herein, we found that blood transfusion was an influential risk factor among the health employees studied. On the other hand we found no correlation between history of jaundice and the presence of HBV markers. However, there is conflicting evidence concerning correlation between these 2 parameters and the presence of HBV markers. Such correlation was variable among those who were studying hazards among health care workers. Some investigators, ours included, found blood transfusion, but not the history of previous jaundice could influence the prevalence of HBV infection. Others found no specific relationship between previous jaundice or blood transfusion, or both, and the HBV markers.<sup>7</sup> Of the potential risk factors evaluated in our study, 3 variables emerged as important variants related to the seropositivity of HBV when we applied logistic regression analysis. These include age, blood transfusion and needle stick and sharps injuries. Others who applied the same analysis found similar results except for the history of previous jaundice and race (non-white in their studies). This discordant particularly in the later factor could be explained by the fact that we are dealing with a homogenous population of the same society where there is no ethnic or origin variation.

Hepatitis B virus infection is common among health care workers and this could be recognized as an occupational risk factor. Effective vaccines for such virus have been available. The initial strategy for such vaccination, which targeted the high risk groups including IV drug users, attendees of sexually transmitted disease clinics, inmates, homosexuals, hemodialysis and health care workers, was ineffective as recently reported by Lee's group.<sup>11</sup> Instead, another approach has begun as to reduce the prevalence of infection, development of HBV Carrier State and the incidence of hepatocellular carcinoma.<sup>12</sup> Therefore, it is particularly important that hospitals and health authorities should implement strict and meticulous policies in order to

minimize such risks among their employees. This should include strict guidelines on sharps and regulations on dealing with blood and other body fluids and their decontamination. Such products should be considered as a potential risk despite that they are being negative for any viral parameters. A clinical microbiologist or an infectious disease specialist should be available to give advice when needed, not only on the implementation of preventive measures and provide education to HHCW but also to give a clinical advice for those who get infected with viral hepatitis.<sup>13,14</sup>

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