Evaluation of Hepatitis B vaccination immune response in health care providers at Albasheer hospital

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Background

Hepatitis B virus (HBV) infection and its sequelae, including chronic liver disease, cirrhosis and hepatocellular carcinoma are major global health problems. About 350 million chronic carriers worldwide constitute the primary reservoir of infection [1]. Exposure to blood and body fluids is a major risk factor for development of HBV infection and it is a well-established fact that in an unvaccinated individual, the risk of acquisition of HBV infection after single exposure of HBV infected blood or body fluid ranges from 6%-30%. Therefore health care workers (HCWs) are at high risk of HBV infection due to repeated exposure [2-4]. In addition non-existing infection control activities and higher prevalence of HBV in our region further augment the risk of health care associated infections (HAIs) transmission of HBV to HCWs.

With the availability of HBV vaccine since 1982, the decline in the incidence of HBV infection and associated morbidity and mortality was reported [5-8]. Therefore, in 1997 CDC recommended that all HCWs should be vaccinated against HBV [9]. Despite the recommendation and excellent protection profile among post vaccinated personnel, compliance to this recommendation remained poor in various health care settings [10,11].

Immune response to HBV vaccine is assessed by measuring antibody level after 6–8 weeks of completion of 3 doses. Hepatitis B surface antibody higher than 10 mIU/ ml is generally taken to be protective [12,13]. Factors associated with decreased immune response include increasing age, smoking, obesity, gender and genetic factors [14-16]. Previous studies on HCWs published from various parts of the world have reported 12–21% non-responders to HBV vaccine (Table 1). Despite HBV infection being a major health care issue in both community and health care settings in , data assessing immune response in HCWs is unavailable. Considering a prevalence rate of 8% in general population [17] possibility of (HAIs) transmission in a health care setting is considerable.

Therefore, we conducted this study at ALBASHEER hospital to evaluate the immune response among health care personnel after completion of their vaccination schedule.

Methods

This descriptive observational study was conducted at ALBASHEER hospital*, from 1/8/2008-31/3/2009. The data was collected from the health care provider files in the hospital.

*ALBASHEER hospital is a 950 bedded tertiary care referral centre with approximately 2400 HCWs.

Newly inducted HCWs in the hospital were immunized with recommended three doses of HBV vaccine as per institutional policy. Immunization was done with recombinant vaccine (Engerix B – Glaxo Smith Kline Biological) and the standard vaccination schedule (0, 1, 2 months) was followed. Adult dose with 20 mcg of hepatitis B surface antigen per ml was administered intramuscularly over deltoid region. Hepatitis B surface antibody (HBsAb) level was measured (EIAgen Anti-HbsAg kit) after 6–8 weeks of completion of vaccination course.

Baseline vaccination was the exposure given to HCWs and the development of antibodies was considered as the outcome variable. HCWs with antibody titers of ≥ 10 mIU/ml were considered responders while those with levels < 10 mIU/ml were labeled as non-responders. Age and gender were included as confounding variables.
Data was entered and statistical analysis was performed in epiinfo. In descriptive analysis percentages of categorical variables (gender, antibody titer level and age groups) were reported. Bivariate comparisons were assessed using chi-square test and logistic regression.

A p-value of < 0.05 was considered as statistically significant.

Table 1: Immune response after hepatitis B vaccine in different populations of world

<table>
<thead>
<tr>
<th>author</th>
<th>Year of publication</th>
<th>Country</th>
<th>Non responders after immunization (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roome A J et al[6 ]</td>
<td>1993</td>
<td>USA (Connecticut)</td>
<td>11.9%</td>
</tr>
<tr>
<td>Averhoff F et.al[20]</td>
<td>1998</td>
<td>USA (Georgia)</td>
<td>12%</td>
</tr>
<tr>
<td>Louther J et.al [21]</td>
<td>1999</td>
<td>USA (New York)</td>
<td>21%</td>
</tr>
<tr>
<td>Platkov.E et.al [22]</td>
<td>2003</td>
<td>ISRAEL (Netanya)</td>
<td>13.5%</td>
</tr>
<tr>
<td>Luiz A.S et.al [23]</td>
<td>2005</td>
<td>BRAZIL (Sao Paulo)</td>
<td>13.6%</td>
</tr>
<tr>
<td>Yen YH et.al [24]</td>
<td>2005</td>
<td>TAIWAN (Kaohsiung)</td>
<td>13.6%</td>
</tr>
<tr>
<td>Saberifiroozi M et.al [25]</td>
<td>2006</td>
<td>IRAN (SHIRAZ)</td>
<td>12.7%</td>
</tr>
</tbody>
</table>

Results

A total of 2400 HCWs are the working population in LBASHEER hospital. However (563) of the HCWs were enrolled. Female participants were 248 (44%) and male were 315 (56%). Overall, 82 (14.6%) of the HCWs after completion of immunization with HBV vaccine did not develop any antibody response and were labeled as non-responders.

The bivariate analysis shows that the frequency of non-responders was higher in males in comparison to females (p < 0.05).

Discussion

This is the first study from ALBASHEER hospital and provides the local epidemiological data assessing the immune response to HBV vaccine in HCWs. In this study, 14.6% of HCW remained non-responders i.e. the serum protective level of ≥ 10 mIU/ML of HBsAb was not achieved after recommended routine HBV vaccination.

Age and gender were the two variables included in our study. The percentage of male non-responders (17.5%) was more than the female (10.9%) counterpart (p < 0.05). This finding was in concordance with Wood et al that reported a response rate of 18% and 9% respectively in male and female (p = 0.006)[15]. Smoking and certain genetic factors have
been reported as probable reasons of decreased immune response in male. However we have not evaluated these factors in our study.

According to the age variations our findings is in the agreement with earlier reports in which there is no difference in the HBV vaccination response between different ages.

This observation counterpart the hypothesis that with increasing age seroprotective antibody formation after vaccination is decreased. This finding is of great clinical significance that HBV vaccination is adequate for all HCWs different ages.

Therefore, from infection control perspective, the post vaccination HBsAb levels should be determined for all HCWs.

Multivariate analysis also favored age and gender as an independent risk factor for non-responders.

In the past there was no data available regarding the immune response after HBV vaccination in HCWs from However studies from different part of the world have reported the immune responses to HBV vaccine in their HCWs. Seroconversion rates in Jordanian HCWs correlated with previous studies conducted in , , and (Table 1).

The major limitation of this study is the inability to evaluate the hepatitis B core antibody (antiHBc) in our study population due to low budget and limited resources.

Therefore there is a possibility that reduced immune response to HBV vaccine was due to occult hepatitis B infection. We agree that a non-responder rate of 14.6% might be an over estimate in our study population; however in a resource limited setting our results are providing a baseline for future epidemiological studies in this area.

Moreover our finding matched with the studies conducted in other countries. Second limitation of our study was that we were not able to evaluate the association of decreased immune response with risk factors other than age and gender. Previous studies suggested that smoking, obesity, nutritional status, site of administration of vaccine and genetic factors also contributed to reduced immune response.

Post vaccination testing is recommended for high risk persons, including health-care and public safety workers; chronic hemodialysis patients, HIV-infected persons, and other immunocompromised persons, and sex or needle-sharing partners of HBsAg-positive persons. However this practice is usually not followed in majority of hospitals [18, 19].

In health care settings pre-exposure vaccination programmes are not only important for safety of HCWs but are also proven cost effective relative to post exposure prophylaxis with hyperimmunoglobulins. The difference between the cost of HBV vaccine and HBV immunoglobulin is enormous as three doses of the HBV vaccine cost around 3.15 JD, and the cost of the HBV immunoglobulin is around 46.25 JD. This extra cost is borne by the institutions or the HCWs, which is an economic burden especially in developing countries.

**Conclusion**

We concluded from this study that the seroconversion rate after completion of scheduled vaccination was more or less similar in our HCWs in comparison to HCWs working in other parts of the world, with similar age and gender variability. There is a need to strictly implement the policy of hepatitis B immunization in every health care setting, as recommended by CDC. It is also extremely important to check the post vaccination status of all HCWs after 6–8 weeks of vaccination as it not only ensures safety of employees but also reduces rate of transmission hence functioning as a cost effective exercise at individual as well as national level.

**References**


9. "Immunization of Health care workers". Recommendation of advisory committee on immunization practice (ACIP) and the Hospital Infection Control Practice Advisory committee (HICPAC). MMWR, Recommendation and report 26:. 12/26/97


