

Risk factors of the efficacy of hepatitis B vaccine in health-care workers

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Background: Conventional hepatitis B virus vaccination fails to achieve efficient protection in about 5%–10% of the world population. Different factors influence the immunogenicity of hepatitis B vaccine. This study aimed to evaluate these factors in health-care workers. **Materials and Methods:** This was a descriptive study which was implemented among 140 of medical and dental staff working as health-care workers who were low responder after vaccination entered the study. **Results:** Age (>40 years), weight (body mass index >25), immunodeficiency diseases, (primary immune deficiency and immunosuppressant drugs), diabetes mellitus, and smoking were the important factors. **Conclusion:** In the high-risk group of hepatitis B disease, the risk factors of immunogenicity must be evaluated at vaccination and check titers of antibody after vaccination.

Key words: Health-care workers, hepatitis B, vaccine efficacy

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INTRODUCTION

Immunogenicity of hepatitis B vaccine (HBV) is 90% in health-care workers.^[1]

Various factors such as obesity, aging, male gender, immunodeficiency, renal failure, intragluteal vaccine administration, chronic diseases, as well as some human leukocyte antigen II, chemokine receptor 5, and chemokine ligand 13 significantly contribute to this failure.^[2,3]

HBV vaccination provides low rates of protection (<50%) among children with HIV exposed, infected and/or older children.^[4]

The immune system becomes less effective with age, and older age is associated with an increased susceptibility to the disease and reduces responses to vaccination.^[5]

Obese individuals' body mass index [BMI] ≥ 30 kg/m² and older age were significantly more likely to be nonresponders following two doses of recombinant HBV (rHBV).^[6]

Patients with diabetes mellitus (DM) and patients undergoing maintenance dialysis show dissatisfactory responses to vaccination, including HBV.^[7]

Due to the lack of immunity in about 10% of vaccine recipients, we decided to perform this study in or health-care worker population.

MATERIALS AND METHODS

This descriptive study was carried out on 1400 health-care workers in Alzahra hospital and dental faculty of Isfahan University of Medical Sciences, Isfahan, Iran, in 2016–2017.

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Table 1: Distribution of risk factors in low responders

Risk factor	Age >40	BMI >25	Immune deficient disease and corticosteroid usage	DM	Smoking	HIV infection	Intracutaneous injection
n (%)	59 (40)	52 (37)	10 (7)	8 (6)	7 (5)	0	0

BMI=Body mass index; DM=Diabetes mellitus

Each individual has received three doses of common HBV and the antibody (AB) titer was checked 3–6 months after the last dose of vaccine. One hundred and forty (10%) of samples were low responders (hepatitis B surface antibody ≤ 10 IU/ml), who were enrolled in the study.

Age, weight, route of vaccine administration, HIV state, DM, immunocompromised factors (primary immunodeficiency by history and the usage of immunosuppressant drugs such as corticosteroids and smoking were evaluated.

RESULTS

Ages of low responders ranged from 22 to 60 years.

Ninety-eight (70%) of them were female. The mean age of vaccinated samples with insufficient titer of AB was 41 years. Fifty-two (37%) had BMI >25 and were overweight. Ten (7%) had immunodeficiency status such as primary immunodeficiency and consumption of immune suppressant drugs.

DM was present in 8 (6%) individuals and 7 (5%) of the samples were smokers.

Neither HIV-infected cases nor intracutaneous vaccine injection recipients were included in the study [Table 1].

DISCUSSION

It is known that four most common factors associated with vaccine nonresponsiveness include: age, BMI or obesity, male gender, and smoking.^[8-10] This study was to answer the question whether these factors and some other factors were associated with vaccine efficacy, using a known efficacious rHBV, in health-care providers (HCP).

Some HCP refuse to be immunized. In one study of medical school clinical employees, for example, only 77% completed the HBV series.^[11]

Vaccination is both safe and effective with seroprotection being achieved in 92% of HCP aged <40 years and 84% aged ≥ 40 years.^[12] Old age was associated with lower seroprotection rates in our study which was in accordance with the study of Averbhoff *et al.*^[6]

In Chaturanga in Sri Lanka observed that HBV immune response was much higher in women than men.^[1,13]

In Azami *et al.*'s study, it was observed that smoking and usage of immunosuppressant drugs are the risk factors for immunogenicity of HBV which is consistent with our study.^[1]

Lower rates of seroconversion were associated with increasing age, greater immune compromise, current smoking, and higher BMI in Alimonos *et al.*'s study^[14] which was consistent with our study.

In Young *et al.*'s study, BMIs particularly over 30 kg/m² are associated with an increased risk of nonresponsiveness to the rHBV,^[15] which is in agreement with findings of our study.

Obesity is increasingly being recognized as a low-grade chronic inflammatory condition,^[16,17] and it is possible that obese individuals exist in a pro-inflammatory state, which interferes with immunogenicity in vaccine candidates.

It is possible that differences in dietary intake may have an effect on the gastrointestinal microbial, and this, in turn, can affect the "Leakiness" of the gut leading to bacterial translocation and increased levels of immune activation.^[18,19]

CONCLUSION

In light of this study, the authors proposed that the risk factors of immunogenicity must be evaluated at vaccination and that titers of AB be checked after vaccination in the high-risk group.

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Conflicts of interest

There are no conflicts of interest.

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