Original Article

Acquired Immunity in Dentistry Students After Hepatitis B Vaccination

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ABSTRACT

Background and Aim: After triple-course vaccination against Hepatitis B (HB), there may be a failure to increase antibody titer value or to maintain it at satisfactory seroprotective levels. This study aimed to evaluate the rate of seroprotection in dental students after receiving complete doses of HB vaccination.

Materials and Methods: In this cross-sectional observational study, Anti-HBs levels of 100 dental students, who had received triple-course HB vaccines, were examined. Titres of more than 100 mIU/ml were considered as protective. The association between various parameters, like gender, age, duration of the last vaccination, booster dose, and comparison of anti-HBs levels at various durations from the last vaccination, was assessed.

Result: Of the 100 participants, 52 were females and 48 were males. The participants' age ranged from 22 to 31 years with the mean age being 28.12±2.552 years in females and 26.88±3.512 years in males. Overall, 65% of the participants had a good immune response i.e. anti-HBs values were more than 100 mIU/ml, 24% had a moderate immune response i.e. anti-HBs values were 11-99 mIU/ml, and 11% had a poor immune response i.e. anti-HBs values were less than 10 mIU/ml.

Conclusion: There was a substantial failure rate in attaining or preserving satisfactory anti-HBs values after routine vaccinations against the HB virus (HBV). Hence, it is very important to determine post-vaccine serological anti-HBs values to take proper booster doses and maintain adequate immunity levels.

Keywords: Hepatitis B Vaccines, Dental Students, Acquired Immunity, Immunization Programs.

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Introduction:

A virus cannot reproduce by itself. However, once it infects a cell, it can direct the cell towards producing more viruses. Viruses have RNA or DNA as the genetic material. The virion, which is the entire infectious virus particle, comprises the nucleic acid and an outer shell of protein.(1)
Hepatitis B virus (HBV) is a common cause of liver disease and liver cancer. HBV is a member of the Hepadnaviridae family; it is a small DNA virus with features similar to that of retroviruses.

HBV replicates through an RNA intermediate and can integrate into the host genome. HBV infection leads to a wide spectrum of liver disease.(2)

The HBV contains several antigens, like HBsAg, anti-HBc, anti-HBs, etc., to which the infected persons can make immune responses. The serological diagnosis of HBV infection is based on the presence of these antigens and their antibodies.(3)

Dentists and dental students are at a heightened risk of exposure to HBV primarily because dentistry involves extensive and intensive use of small, sharp instruments that can easily get contaminated with infected blood, during an invasive procedure, which is the main mode of transmission of HBV. Exposure for general dentists is about 3–4 times greater, and for nonimmunized surgical specialists, about 6 times greater than that of the general population.[4]

Hence the awareness of dental students about the measures that can prevent the transmission of hepatitis B is of great importance and vaccination is the best known method for prevention against HBV infection.[5]

The awareness of dental students about the measures that can prevent the transmission of hepatitis B is of great importance. It is necessary that they start the clinical practice immunized with the vaccine are response monitored and well informed about the possible transmission of viral infection in the dental office. Rarely there have been studies to access their immunization status. Hence this study is needed to evaluate the extent of seroprotection after receiving complete hepatitis B vaccination schedule.

Materials and Methods:

In this descriptive cross-sectional study, anti-HBs titer values of 100 dental students of Al Badar Rural Dental College and Hospital were assessed. The participants were sequentially approved according to the inclusion criteria-completion of primary vaccination schedule of 0, 1, and 6 months, and at least one month must have been passed from the completion of the last vaccination. The exclusion criteria were participants with a history of immune disorders or those who are currently on immunosuppressants. All the participants signed informed consent forms. Data were collected by filling questionnaires in addition to an examination of anti-HBs using available immunoassay kits (Abbott Laboratories, Architect Park, Ireland) in a private laboratory (Ethics Committee No. IERB/2016-17/24).

The analytic tests used were the chi-square test and the student's unpaired t-test.

The state of immunity was categorized as follows:

Good immune response: anti-HBs values more than 100 mIU/ml.

Average immune response: anti-HBs values between 11 and 99 mIU/ml.

Poor immune response: anti-HBs values less than 10mIU/ml.

Result:

The present study involved 100 subjects (52% female and 48% male). The minimum age of the females was 22 years, and the minimum age of the males was 24 years. The maximum age of the females was 31 years while the maximum age of the males was 29 years. The mean age of the females was 28.12±2.55 years. The mean age of the males was 26.88±3.51 years. Overall, 63% of the subjects had taken the last vaccination less than 5 years ago while 23% had taken the last vaccination more than 5 years ago. Moreover, 14% had no information regarding the duration of the last vaccination. In addition, 28% had taken the booster dose, 62% had not taken the booster dose, and 10% had no information regarding the booster dose taken. In addition, 65% were highly immune, 24% were immune, and 11% were with weak immunity. In addition, 63% of the subjects, who had taken their last vaccination less than 5 years, had maximum immunity, and 23% of the subjects, who had taken the last vaccination more than 5 years ago, had maximum immunity.

The mean anti-HBs value was 415.31±403.71 mIU/ml in females and 527.27±467.81 mIU/ml in males (P=0.2022).

Discussion

The present study showed that 65% of the subjects had a good immune response, 24% had a moderate immune response, and 11% had a poor immune response. This finding is in harmony with the results of studies by Eshag et al that reported 46% failure and Rajabipour that reported 44% failure to produce necessary rates of the immune response.[6,7] However, our finding is not in agreement with that of Ramezani et al and Sivarajasingam and Ogden, who reported 13% to 15% rates for titers lower than 10 mIU/ml, respectively.[8,9] This might be attributable to the different timings of post-vaccine serological

testing. In addition, Estevez et al, Velu et al, and Van Damme et al also reported much lower rates of failure (≤ 3%), which might be rooted in short-term evaluations of anti-HBs titers in those studies. [10-12]

Some studies have specified that the decline in anti-HBs titers does not necessarily show a lack of protection against HB. Nonetheless, anti-HBs evaluation is still the most cost-effective protection predictor. [13]

Our study consisted of 100 subjects (52 females and 48 males). The study showed no statistically significant difference between male and female participants. This is comparable with the studies conducted by Eshag et al and Sahana et al with more female subjects.[6,14] This is not in agreement with the study done by Rao et al and Batra et al with male predominance.[15,16] This higher number of female subjects in the study suggests high awareness about getting post-vaccine serological tests done among females.

The study showed no statistically significant difference in age among males and females. This small difference in the subjects' age is in accordance with the study done by Eshag et al.[6] This is not in agreement with a study done by Tele et al indicating that the response following a three-dose series is typically greater than 95% in young healthy people and decreases with age to less than 90% response at the age of 40 years and only 75% response at the age of 60 years.[17] However, we could not assess the age difference since our subjects were all dental students with small differences in age.

Among the subjects, 14% had no information regarding the duration since their last vaccination, 63% had taken their last vaccination in the last 5 years, and 23% had taken their last vaccination more than 5 years ago, suggesting that the majority of the participants were aware of their HB vaccination and that anti-HBs values do fall with time. This finding is not in agreement with the study done by Eshag et al in which all the subjects had received all vaccine doses at the exact intervals.[6]

We included all dental students who had completed their vaccination series of 0, 1, and 6 months, and at least one month had elapsed since their last vaccination; this is in agreement with the study done by Eshag et al but not in agreement with the study done by Sahana et al with subjects at six months post-vaccination.[6,14]
In the present study, the students performed anti-HBs testing even many years after vaccination because they were vaccinated in the past and desired to know whether they were protected against HB or not.

There was a statistically significant difference in the duration of the last vaccination and immunity status. There was also a decrease in the immune levels as duration progressed so the peak time of immunization is 0-5 years from the last immunization period. The chi-square value was 11.936 with P=0.018, which is statistically significant.

There was a significant decline in antibody titers as the years past from vaccination. This finding is in agreement with the study done by Sahana et al showing that 80% of the subjects were protected 6-10 years after vaccination and 72% after 10 years.[14] Pamplona et al observed 80.9% protection 5 years after vaccination and further decrease to 46.1% after 10 years.[18]

As the antibody titer decreases, it is strongly recommended to test anti-HBs values periodically to ensure proper maintenance of the antibody titer.

The fall in anti-HBs titers over 5 years is in harmony with a study by Arias-Moliz et al in which 30% of the vaccinated healthcare workers, mainly treating doctors, were unaware that their anti-HBs titers had dropped to less than 10 mIU/ML.[19] This finding also gives us a clue that a booster dose is required after every 5 years of immunization.

Since most of our study subjects had not done post-vaccine serological tests to determine the anti-HBs value previously, this study was of immense help for them to know about the importance of post-vaccine serological testing, and booster doses were given to those with a poor immune response (anti-HBs less than 10 mIU/ml). However, this study had some limitations. As most of the data were collected by filling questionnaires, there might be bias factors like forgetting the exact vaccination date. The study was conducted on a relatively small sample size, which could affect the statistical association. This study included dental students between 22 and

31 years of age, thereby limiting the prospect of taking into account the possible effects of age on various factors. Only four male subjects confirmed that they were smoking cigarettes; hence, the variable of smoking could not be assessed. In our study, students had been vaccinated against HB using vaccines of different pharmaceutical companies. Since the subjects failed to provide details regarding their vaccines, we could not assess the difference in anti-HBs levels caused by vaccines manufactured by different pharmaceutical companies.

Conclusion:

The results showed a significant decline in anti-HBs values post-vaccination. Hence, it is important to perform post-vaccine serological testing. Adequate booster doses should be taken if required to maintain a good immune response against the HBV.

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