

SERUM ANTIBODY ANALYSIS FOLLOWING HEPATITIS B VACCINATION FOR OCCUPATIONAL RISK ASSESSMENT AMONG DENTAL STUDENTS

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Abstract :

Background & Objectives: Hepatitis B is the most important infectious occupational disease for the health care workers. Dental surgeons are frequently in contact with blood and saliva and hence are at high risk for Hepatitis B Virus (HBV) exposure. HBV infection is a major public health problem in India, as there are 45 million estimated carriers. Immunization against HBV reduces the risk of transmission of HBV to dental personnel and from dental personnel to patients. The present study was aimed to evaluate the serum levels of anti-HBs in vaccinated dental health care workers.

Methods: In this study, estimation of serum levels of Anti- HBs in 40 dental students vaccinated against HBV was done. Data was obtained regarding vaccination data, age, sex, weight, height and smoking history. Anti-HBs level was evaluated two years after the 1st dose of vaccination. Low responders were given booster vaccination and post booster anti HBs assay was done.

Results: The study included 110 hepatitis B vaccinated dental students. Out of 110 students only 40 students had documented history of complete vaccination and volunteered to be a part of the study. Among these 40 students, three students (7.5%) had less than 100 IU/L anti-HBs level and 37 students (92.5%) had more than 100 IU/L anti-HBs level. Anti- HBS level above 100 IU/L is identified to be protective. Following booster vaccination, low responders showed anti -HBs titre more than 100 IU/L.

Conclusion: In this study majority dental students had desirable immune response to the HBV vaccine. Male gender and positive smoking history could have attributed to low anti-HBs titre in subjects who had inadequate levels in our study. Hence, all Health Care Workers, in particular dental surgeons with contributory factors like smoking habit, male gender should undergo periodic assessment of anti-HBs titre.

Keywords: Anti-HBs; Hepatitis B Virus; Dental Students

Introduction :

From the time immemorial man has been interested in trying to control disease and for well being.¹ Oral health care workers are exposed to a variety of infectious agents because of their occupational exposure to blood borne and airborne pathogens.² According to World Health Organization, about a third of the world's

population (2 billion people) has been infected, and 400 million people are chronic carriers.^{3,4} Hepatitis B virus (HBV) infection is a major public health problem in India, as there are 45 million estimated carriers.⁵ Many studies documenting various populations at a higher risk for hepatitis B virus exposures were performed. Dentists were listed near the top of the list, followed by members of the dental staff.⁶ The Hepatitis B viral infection can be controlled by immunizing susceptible people, interrupting the routes of transmission, and treating the chronically infected.⁴ The vaccination of health care workers (HCWs)

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has been highly recommended.⁷ Previous studies have shown that the level of anti-HBs in vaccinees declines rapidly within the first year and more slowly thereafter.⁸ Since not many studies have been done on this aspect in dental student, this study aims to find out the persistence of anti-HBs in vaccinated dental students to measure an existing protection.

Materials and Methods:

The study comprised of 110 students of a dental college in India. They were vaccinated against hepatitis B. Ethical clearance was obtained from the institutional ethical committee. Informed consent was obtained from students who volunteered to be a subject for the study. Data was obtained from Hepatitis B vaccinated students regarding age, sex, weight, height, smoking history and vaccination schedule, such as precise date of vaccination for every dose.

Body mass index (BMI) was obtained by dividing the weight in kilograms by the square of height in meters. Individuals who were vaccinated with vaccination schedule of 0, 1, 6 months were included in the study. Individuals with a history of jaundice and individuals with a history of

Table 1: Age distribution of the students involved in the study

Age (years)	Number of individuals	Percentage
20	5	12.5
21	12	30.0
22	12	30.0
23	5	12.5
24	4	10.0
27	1	2.5
28	1	2.5
Total	40	100.0

Figure 1: Gender distribution of study population

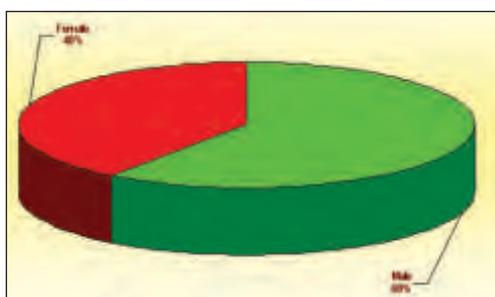
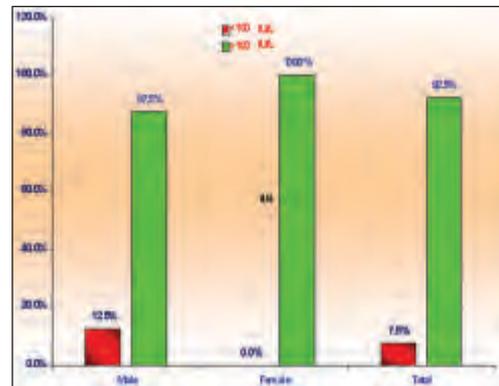


FIGURE 2: Distribution of Anti-HBs Ab among the study population



incomplete vaccination were excluded from the study. Among 110 dental students 40 students were eligible and volunteered to be a subject for the study. Two year after the 1st dose of vaccination, antibody to hepatitis B surface antigen (anti-HBs) level was evaluated in the study.

With due consideration of the aseptic precautions, 2ml of venous blood sample was collected and evaluated for hepatitis B surface antibody using electrochemiluminescence immuno assay (ELECSYS 2010, Germany) at a diagnostic laboratory. Booster vaccination was given for the students whose anti-HBs titre was less than required level. After one month of booster vaccination hepatitis B surface antibody assay was redone.

Results:

All 40 students involved in the study were in the age group of 20 to 28 years. The mean age of the students was 22.50 1.70 years. The data regarding the age distribution of the study population is shown in (Table 1). The data regarding the gender distribution is shown in (Figure 1). Since our study group involves high risk individuals serum anti -HBs level more than 100 IU/L was considered as protective.

In this study out of 24 males, 21 males had anti- HBs level more than 100 IU/L and 3 males had less than 100 IU/L anti-HBs level. All females had more 100 IU/L anti-HBs level. Out of 40 students, 3 students had less than 100 IU/L anti-HBs level. All the three low responders were males. Distribution of Anti-HBs among the study population is shown in (Figure 2).

In present study 7 subjects had history of smoking. Among 7 smokers 3 showed inadequate anti-HBs level. These 3 subjects after one month of booster vaccination had anti-HBs titre more than 100 IU/L. All subjects BMI range was within 18.5 to 25.

Discussion :

Hepatitis B is the most important infectious occupational disease for the health care workers.⁹ The Advisory Committee on Immunization Practices defines health care workers as members of the professions of medicine, nursing, dentistry, biomedical laboratory technicians, and emergency medical personnel.¹⁰ The high risk of being infected is the consequence of prevalence of virus carriers in the assisted population, the high frequency of exposure to blood, body fluids and the high contagiousness of hepatitis B virus.⁹ Immunization and post exposure management are among the integral components of complete infection control programme for HCWs.¹¹ Risk of transmission of hepatitis B virus to dentists have been evaluated by many investigators. According to many studies dental professionals were found to have greater risk of HBV infection.¹²⁻¹⁶ It was reported that factors such as age, years of dental practice, and number of treated patients with hepatitis were significantly correlated to risk of infection.¹⁷

Our study was carried out in a group of dental students; similar studies have been carried out in past involving infants, adolescents, medical professionals, public safety personnel and homosexuals.¹⁸⁻²³ Our study carries significance because dentists are considered to be high risk category along medical professionals.

In our study the serologic immune status of vaccinated dental students was assessed at the end of two years after the first dose of primary vaccination. Majority of studies have reported a 90% reduction of the anti-HBs level in the first 24 months, followed by a much slower decline during the later period.^{24, 25}

In the present study 100 IU/L anti-HBs level was considered as base value for adequate antibody titre.

Although in many other populations based studies 10 IU/L was considered as minimum value for adequate anti-HBs level. Our study involved higher base value (100 IU/L) because high risk group (dental professionals) being evaluated.

In present study 7.5 % subjects had less than 100 IU/L anti-HBs level at the end of two years after beginning of vaccination. Study finding is consistent with few other studies.^{26, 27} A three year follow up study showed higher percentage of vaccinees with anti-HBs level below 100mIU ml⁻¹ one year after beginning of vaccination.²⁸

Gender based information in our study revealed higher anti-HBs level in females compared to males. This was consistent with earlier studies who reported of higher anti-HBs level in females.²⁹⁻³⁵ We compared male to female ratio of anti-HBs titre levels in vaccinated individuals. In this study out of 24 males, 21 males (87.5%) had anti-HBs level more than 100 IU/L and 3 males (12.5%) had less than 100 IU/L anti-HBs level. All 16 females (100%) had more 100 IU/L anti-HBs level. However, this male to female ratio was statistically non significant (p value - 0.141). This could be attributed to small sample size. Studies with larger sample size only can help to draw conclusive remarks.

In our study 3 of the 7 smokers showed anti body titre below 100IU/L, this accounts to nearly 42.85%. This is in consistency with decreased antibody titres noticed in smokers in other studies.³⁰ Cigarette smoking is associated with range of alterations in immune function, the mechanism of which are not yet fully understood. It has been supposed, the diminished response in smokers may be due to the increasing of T suppressor lymphocytes.³⁶

Our study we used electrochemiluminescence technique, radioimmunoassay is the other investigative modality for the evaluation antibody titre in other studies.^{31,37}

Sample size variations have been observed in various studies depending on study subjects. In studies involving health care professionals and students are smaller sample size has been considered.^{20,28} Where as in studies involving

general population a larger sample size is considered.³⁸⁻⁴⁰ Our study involved relatively small sample size of 40.

Most of the studies involving HBV antibody titre were prospective nature with sample analysis being carried out at different intervals.^{21,25,38,41,42} Our study however was cross sectional in nature and antibody analysis was done only at one point of time.

In a retrospective cohort study five independent variables were identified as adverse prognostic factors for seroconversion. These predictors included increasing age, chronic disease, male gender, obesity, cigarette smoking.⁴³

In our study none of the three low responders were obese. In the obese individuals the vaccine may be deposited in fat tissue rather than muscle and this causes diminished immunity response. It was believed that hormonal effects in overweight persons can decrease antibody titers.⁴⁴

Although booster injections of vaccine are not widely recommended few studies indicated that an additional dose of vaccine given to those vaccinees who showed an anti-HBs response < 100mIU ml-1 after the primary vaccination was useful to elicit a more vigorous antibody production and to delay the decline in the protection afforded by the vaccine.²⁸ Booster vaccination was given to the HCWs who had anti-HBs titre below 100 IU/L and post booster anti-HBs titre was assessed. These HCWs responded well to the booster vaccination.

Health care workers at risk who have antibody levels below 100 IU/L should receive booster injections. If levels remain

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low, adequate protection against occupational exposure cannot be assumed.⁴⁵ The term booster refers to vaccination given some time after a primary vaccination series and with the aim of providing protective immunity/ protection against significant break through infection.⁴⁶ Few researchers recommended revaccination based on the post vaccination antibody level for maintenance of protection.^{20,47} Jilg W et al⁴¹ proposed that everyone with anti-HBs values below 100 IU/L after the last dose of vaccine should be revaccinated within 6 months. Those with maximal anti-HBs between 101 and 1000 IU/L should be checked up 1-2 years after the first vaccination; people with 1001-10000 IU/L should be checked up after 2-4 years; and those with levels above 10000 IU/L should be checked up after 4-6 years. All the study subjects were informed about their anti-HBs titre and were informed to assess their anti-HBs titre periodically depending on their antibody titre.

Conclusion :

The present study emphasizes on assessment of anti-HBs level after vaccination against HBV. Tobacco smoking was found to be associated with low anti-HBs titre of 7.5% dental students. Smokers are likely to have decreased anti-HBs titre. The study shows that young healthy individuals without any contributing factors likely to have adequate anti-HBs titre at the end of 2 years. Study recommends periodic monitoring of anti-HBs assay for all health care workers, especially individuals with factors such as male gender and smoking.

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