

Study of post-vaccination anti-hbs anti body levels amongst medical students and health care workers in medical College

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Abstract

Hepatitis B virus (HBV) is one of the most contagious pathogens where the risk of exposure is very high among health care workers, especially students. This study evaluates the post vaccination protection status by measuring post vaccination anti-HBs antibody level. One-hundred-eight participants (medical college students and Health Care Workers-HCWs) over 17 years of age gave consent to participate in this study, interviewed for their vaccination history and then had their blood serum taken for anti-HBs to determine the protectivity. There were 80.5% participants with a protective anti-HBs level above 10mIU/mL and 19.5% without a protective anti-HBs level. Twenty-one of them had vaccinated during infancy but majority of them got their vaccination against HBV at the time of joining in the medical college.

None of the participants underwent a post-vaccination serological test (PVST) to determine their

immune response following vaccination. These results indicated the vulnerability of medical students and health care workers to the risk of HBV transmission while performing medical care. With the high incidence of HBV transmission, educational institutions are encouraged to make provisions for vulnerable students and HCWs to receive vaccination or a booster and an adequate PVST before their joining.

Keywords: PVST, HBV, HCW, DNA

Introduction

Hepatitis B virus (HBV) infection is one of the most common chronic viral infections in the world, with a global prevalence of chronic carrier rate varying between 0.1 and 20%.⁽¹⁾ HBV is a DNA virus from the hepatotropic Hepadnaviridae family with no direct cytopathic effect in its mechanism of liver damage, the damage resulting from interactions between HBV and the host's immune system. The clinical presentation of Hepatitis B can range from asymptomatic to

identifiable liver damage, where chronic HBV infection may progress to cirrhosis and hepatocellular carcinoma (HCC).⁽²⁾

HBV is transmitted percutaneously through mucosal exposure to infected blood or other body fluids from hepatitis B patients. One of the riskiest populations is healthcare workers, especially medical students due to their lack of experience in performing clinical procedures make them susceptible to accidental exposure. Needle injuries were often experienced by healthcare workers in endemic areas.⁽³⁾

In addition to universal standard precautions, another preventive measure against HBV is vaccination, which has been a mandatory program in India. Vaccine response might vary among individuals. Protective titre of anti-HBs antibody is above 10mIU/mL. Some individuals may not form adequate immune response and levels of anti-HBs titre might decline over time leading to poor immunity against this infection. Although immunity to hepatitis B has a strong anamnestic response, some studies still recommend boosters especially in individuals with the low initial response, living in the endemic area, and often in contact with hepatitis B.⁽⁴⁾

Objectives

1. Estimation of post-vaccination anti-HBs levels amongst medical students and Health Care Workers (HCW) in medical college
2. Helping them to vaccinate against HBV if their anti-HBs level is below the protective level.

Methodology

This study was conducted after getting the Institutional ethical committee clearance.

Sample size: 108

Study Population: Subjects were at random as representatives of all MBBS students and residents enrolled from 2017 to 2018 at Madurai Medical College and health care workers working in Institute of Microbiology, Madurai Medical College.

Inclusion Criteria

The inclusion criteria were healthy subjects aged over 18 years. Participants were explained about the study and asked to complete an informed consent form and questionnaire that included questions on health history and data related to HBV immunization.

The criteria included the following 1. History of vaccination against HBV during infancy or adult (recent). 2. If they have completed all doses of HBV (1,2,6 and Booster) the vaccination status was considered as complete vaccination and if they have one or two doses, they were categorized into incomplete vaccination status.

Study period: six months

Methodology

This study was conducted in December 2019 at Institute of Microbiology, Madurai Medical College, Madurai. The population of this study was II-year, III-year medical students, post graduates doing MD microbiology at the institution and health care workers working in Institute of Microbiology.

Subjects were given a questionnaire containing basic demographic details, the history of vaccinations, age of vaccination, type of vaccine, and the number of doses administered. They were asked about previous diseases, treatment history and drug intake. Five ml of blood was collected under sterile aseptic universal precautions. Serum was separated, aliquoted & stored in -80°C.

All the samples were tested by ELISA method for quantitative anti-HBs using Rayto (RT 2100-C) and

Cortez Diagnostics kit. The results of the test were validated according to the kit manufacturer’s guidelines and interpreted.

A cut-off value of more than 10 mIU/mL is considered as a protective Anti HBs antibody titre.

The results were analysed statistically. Demographic data and data regarding correlation between Hepatitis vaccination status and anti HBs antibody titre were analysed.

Results

In this study, 108 enrolled members, 71 students consisting of 39 females and 32 male, and 37 health care workers consisting 21 females and 16 males working in Institute of Microbiology all aged over 17 years participated with consent and willingness (Table 1)

Table 1: Age & sex distribution of participants

Age	Male	Female	Total
18 -21yrs (MBBS Students)	32	39	71
>22 yrs	16	21	37
Total	48	60	108

Out of the total 108 participants 48 were male & 60 female

Table 2: Level of vaccination among infant vaccinated & recently vaccinated subjects

	Completed	Incomplete	Total
Infant vaccination	21	0	21
Recent (Adult) Vaccination	48	39	87

Subjects were asked for a history of Hepatitis B vaccination including vaccination before joining medical education or at infant age, involving communication with parents and family to provide

adequate information. The majority of subjects (87) were vaccinated for HBV only during adulthood (recent). Only 48 of them have completed the full course of vaccination. Twenty-one subjects received vaccination in infancy (Table 2). All of them have received the recombinant vaccine. Participants who received vaccination during infancy, completed their 3 doses and booster course at that time.

Table 3: Laboratory test results of subjects for Anti HBs titre

Test result of Anti HBs level	< 10mIU/ml			>10mIU/ml		
	Male	Female	Total	Male	Female	Total
18-21yrs	5	5	10	27	34	61
>22 yrs	6	7	13	10	14	24
Total	11	12	23	37	48	85

Table 3 shows the laboratory test results of the subjects for estimation of Anti HBs antibody titre. Of the 108 healthy subjects examined for ELISA total anti-HBs antibodies, the majority (85) of them have protective antibodies against hepatitis B. Twenty-three of them did not have the protective level. Nearly 48 females, 37 males had been protected against Hepatitis B by antibodies irrespective of their level of vaccination.

Table 4: Protective titre among Infant vaccinated subjects

	Protective titre	Less than protective titre	Total
Complete vaccination	14	7	21
Incomplete Vaccination	0	0	0

Figure 1: Protective titre among infant vaccinated subjects

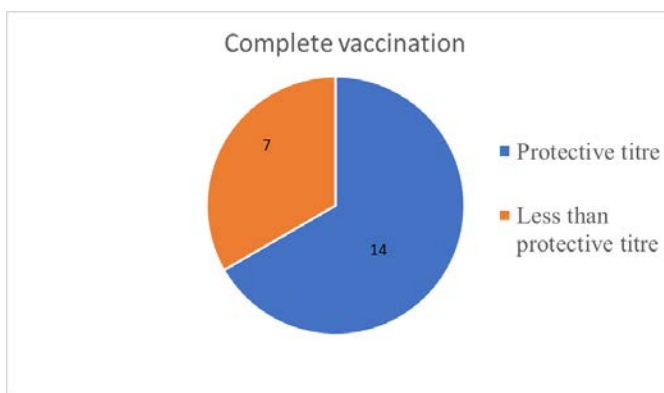


Figure 1

Based on infant vaccination history, out of 21 participants, 7 of them had an anti-HBs level below 10mIU/mL. There was long duration of gap (>15 years) since last vaccination. Eleven of the infant vaccinated subjects had maintained their protective antibody level even after long gap since last vaccination.

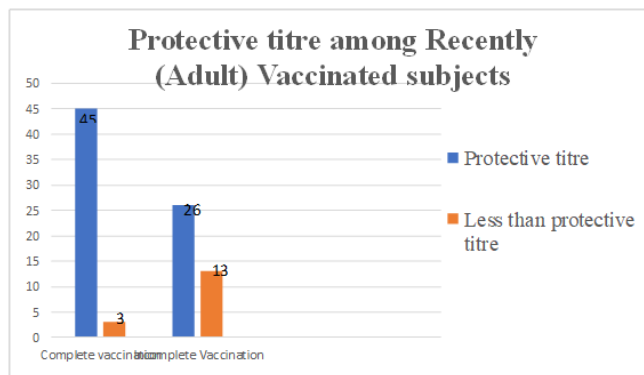
Table 5: Protective titre among Recently (Adult) Vaccinated subjects

	Protective titre	Less than protective titre
Complete vaccination	45	3
Incomplete Vaccination	26	13
	71	16

Sixteen subjects who received the recent (adult) vaccination had an anti-HBs level below 10mIU/ml. But 13 of them had history of incomplete vaccination and Two resident with complete vaccination history not have adequate level because of history of long duration (>10 years) since last vaccination. Only one student had not formed protective level of antibodies even after full course of vaccination. Seventy-two (adult) vaccinated subjects have formed protective antibody level. Twenty-six of them had incomplete vaccination history

and 4 residents had long duration of gap (>10 years) since last vaccination

Figure 2: Protective titre among recently (adult) vaccinated subjects



Discussion

We enrolled 108 medical students and health care workers as subjects and more of them were females. This number coincides with the fact that the majority of medical students and HCWs are females in the study site and the sampling does not discriminate the sexes involved because there was no hepatitis B prevalence data that distinguish between genders.

We identified only 21 participants who received hepatitis B vaccination in childhood and they all had completed their course.

Other 87 subjects who received vaccination recently during the time of joining to medical college or in the time of joining to jobs. None of them had done a post-vaccination serological test for estimation of antibodies levels as recommended by CDC⁽⁵⁾ to see the individual response to form adequate antibody after completing vaccination dose. Studies regarding vaccination response after immunization showed responses varied between 60 to above 90 percent.⁽⁶⁾ Our study showed a response of 80.5% which is comparable to the most of the studies conducted worldwide.⁽⁷⁾

Only Twenty-one subjects showed a protective antibody level below 10 mIU/mL. Seven of them received complete vaccination during infancy. Antibodies against HBsAg might decrease over time, and this statement had already been in many studies. But immunity against hepatitis B had a durable memory. The problem was the absence of adequate serological testing before and after vaccination, i.e., PVST (post-vaccination serological testing) as recommended by many global guidelines.⁽⁸⁾

Another sixteen with adult vaccination also had declined antibody level below 10 mIU/mL, thirteen had a history of incomplete vaccination, two residents with history of complete vaccination before 10 years. Incomplete vaccination may not raise the antibodies level to the protective levels in all vaccine recipients. Complete vaccine administration, especially with boosters in individuals should be able to provide a very significant increase in antibody level. Only one subject with complete adult vaccination not formed adequate level of antibodies. She needs another course of vaccination and re-estimation of antibody level to rule out non-responder group.⁽⁹⁾

These students are vulnerable to hepatitis B infection and also have the risk of transmitting the disease to the patients during their care.

Outcome

From infant vaccination group, 21 students with completed vaccination history and 14 had maintained adequate antibody level above 10 mIU/mL. But 7 had low protective antibody titre. Decreasing level may be due to long duration since infant vaccination and no booster as per recommendations.

Participants with recent vaccination history, 71 out of 87 had adequate level of protective antibodies.

Thirty-nine participants with incomplete vaccination history, 13 had low protective antibody titre. One or two doses of vaccination may not give adequate protection.

Forty-eight participants with complete vaccination history, 45 of them had maintained adequate antibodies. Two residents had low level, there was more than 10 years gap since last vaccination. Another one student not able to attain adequate level of antibodies after complete vaccination, need further course of vaccination and re-estimation of antibody titre.

Conclusion

Vaccination against HBV during infancy must be followed with full course and booster dose as per National Immunization guidelines.

Vaccination against HBV is mandatory for students who enroll in medical college and paramedical institutions.

Post-Vaccination Serological Testing (PVST) for Anti-HBs antibody titre recommended for all students enrolled in medical college and paramedical institutions as per global guidelines.

Students with inadequate levels of antibody titre are advised to get another course of vaccination against HBV and re-estimation also recommended for them.

Non-responder must be ruled out as per revaccination and re-estimation of values and they need utmost protective care to avoid exposure.

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