

# Immunization Status of Health Care Personnel Post Hepatitis B Vaccination in a Tertiary Care Centre in Central India

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## ABSTRACT

### BACKGROUND

Health care personnel (HCP) are the most exposed sector to contract Hepatitis B from infected patients, and vaccination is a key modality to prevent it. We wanted to evaluate the immune status of health care workers (HCWs) post vaccination and bring to light the potential risk factors that may be responsible for low Anti-HBs antibody titres post vaccination.

### METHODS

A cross-sectional study was conducted at Acharya Vinoba Bhave Rural Hospital (AVBRH), Sawangi, with 171 HCP who completed the hepatitis B vaccination. Serum Anti-HBs levels were assessed using ELISA.

### RESULTS

Of 171 HCP, 30 (17.54 %) were males and 141 (82.46 %) were females. The mean age of the study population was 35 years. 73.68 % of the total HCP study population showed antibody titres above the predefined protective threshold. The only risk factor significantly associated with serological response was chronic illness. There was no significant association of serological response to time since last dose ( $P = 0.3$ ), BMI ( $P = 0.67$ ), percutaneous / mucocutaneous exposure ( $P = 0.7$ ) and post vaccination period ( $P = 0.246$ ).

### CONCLUSIONS

Hospital administration should promote testing of Anti-HBs levels in all HCWs 1 - 2 months' post Hepatitis B vaccination so that necessary precautions can be taken, and revaccination with counselling should be strictly followed.

### KEY WORDS

Health Care Personnel (HCP), Risk Factors, Anti-HBs Levels, Immunization Status

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**BACKGROUND**

Globally Hepatitis B is the most common cause of chronic liver disease and hepatocellular carcinoma. Approximately one-third of the world's population has serological evidence of current or past infection with hepatitis B and approximately 350 – 400 million people are chronic HBsAg carriers.<sup>1</sup> Every year, one million Indians are at risk and about 1 lakh die from HBV infection. There are 45 million HBV carriers in India. Of all the HBsAg carriers about 15 – 25 % are likely to suffer from cirrhosis or liver cancer or may die prematurely.<sup>1,2</sup> The target set in the Global Health Sector Strategy on viral hepatitis for 2016 – 2021, which was approved by World Health Assembly in May 2016 was "A 30 % reduction in new cases of Hepatitis B and C by 2020". The World Health Organization (WHO) recommends the hepatitis B vaccine for adults with highest risk of acquiring HBV infection, which includes healthcare personnel (HCP), patients who frequently require blood transfusion, phlebotomists, sexual contact of persons with a chronic HBV infection, persons with multiple sexual partners.<sup>3</sup>

Percutaneous and mucosal exposure to infective blood and body fluids is the common mode of transmission of HBV. Due to frequent handling of blood and body fluids of patients, HCP are four times more at risk of contracting hepatitis B infection compared to the general population.<sup>4,5</sup> The hepatitis B vaccine is the mainstay of hepatitis B prevention. Hepatitis B vaccine provides protection against infection with HBV by producing Anti-HBs (antibodies to the surface protein of the virus). CDC recommends post-vaccination serologic testing for anti-HBs 1 – 2 months after the last vaccine dose for HCP at risk of occupational percutaneous or mucosal exposures. Age, obesity, gender, smoking, immunity, and genetic factors may be responsible for reduced immune response to vaccination.<sup>6,7,8,9</sup>

**Objectives**

- To evaluate the immune status of HCP post hepatitis B vaccination.
- To assess risk factors affecting the Anti-HBs antibody response post hepatitis B vaccination.

**METHODS**

A cross-sectional study was conducted at a tertiary care Rural Hospital in Vidarbha region for a period of one year between Oct 2016 and Oct 2017. The study participants were 171 HCP who had completed the hepatitis B vaccination as per 0 - 1 - 6 schedule. Written consent of the participants was obtained after explaining the details of the study. Information including age, sex, occupation, vaccination status, health status and other relevant data about the participants were collected.

With all aseptic precautions 4 ml venous blood was collected from all the participants. Blood was allowed to clot and serum separated by centrifugation. Serum was stored at -20 degree Celsius till further processing. The quantitation of serum anti-HBs level was done by Enzyme linked immunosorbent assay (ELISA) test using a commercially

available kit, HBsAg (DIA.PRO), Milano, Italy. Samples that gave negative, gray zone and unequivocal results were retested. Samples giving Anti-HBs levels of more than 250 mIU / ml were diluted 1: 10 or 1:100 and retested.

**Statistical Analysis**

SPSS 20 software was used for analyzing the data of age, sex, BMI, time since last dose etc. against anti-HBs levels. Comparisons were made by using cross tabulation with chi-square test. P < 0.05 was considered statistically significant

**RESULTS**

Of the 171 HCP included, 30 (17.54 %) were males and 141 (82.46 %) females, and age of the subjects ranged from 20 to 50 years with 108 (63.16 %) between 21 and 30 years, 40 (23.39 %) individuals between 31 and 40 yrs., 21 (12.28 %) between 41 – 50 yrs. and 2 (1.17 %) were above the age of 50. Overall, 73.68 % subjects demonstrated protective immune titres (>10 mIU / ml of Anti-HBs). [Table 1] Those HCWs who had history of any chronic illness such as Hypertension or diabetes had a significant decline in Anti-HBs level even after 3 doses of vaccination (P = 0.001). Other factors like age, sex, time since last dose, BMI, h / o of percutaneous exposure were not found to be significantly associated with antibody response. Association with Number of doses, smoking and alcohol history cannot be anticipated due to small sample in each cell. [Table 2]. On applying logistic regression, it was found that those who had no chronic disease had 4.9 and 3.61 higher chances of having anti-HBs level in category 10 - 100 and more than 100 respectively compared to less than 10.

Participants	Participants with Anti-HBs < 10 mIU / ml	Participants with Anti-HBs ≥ 10 mIU / ml
Male (N = 30)	6 (20%)	24 (80%)
Female (N = 141)	39 (27.66%)	102 (72.34%)
<b>Total (N = 171)</b>	<b>45 (26.32%)</b>	<b>126 (73.68%)</b>

*Table 1. Sex Wise Distribution of Participants*

Risk Factors	Anti-HBs titre		X <sup>2</sup> P Value
	< 10 mIU / ml N = 45	≥ 10 mIU / ml N = 126	
Age mean (SD)	32 (8)	62 (8)	F - 1.06, P - 0.36
Sex	Male (%) N = 30 Female (%) N = 141	6 (20%) 24 (80%)	X <sup>2</sup> - 1.45, P - 0.45
Time since last dose	< 5 yrs. (%) N = 159 5 - 10 yrs. N = 5 > 10 yrs. N = 7	43 (27.04%) 2 (40%) 0 (0%)	X <sup>2</sup> - 2.32, P - 0.3 (df = 1)
BMI mean (SD)	21.96 (4.08)	21.74 (3.86)	F - 0.03, P - 0.67
Smoking present N = 6	2	4	Cannot be calculated
Alcoholism N = 13	3 (23.08%)	10 (76.92%)	Cannot be calculated
H / o percutaneous or mucocutaneous Exposure N = 17	5 (29.41%)	12 (70.59%)	X <sup>2</sup> - 0.49, P - 0.7
H / o chronic disease N = 36	18 (50%)	18 (50%)	X <sup>2</sup> - 13.97, P - 0.001

*Table 2. Association of Various Risk Factors with Antibody Response to Hepatitis B Vaccine*

**DISCUSSION**

Hepatitis B infection is the most common occupational disease for the healthcare workers. Knowledge of the Immune status

post vaccination in HCP is of prime importance in preventing spread of infections among the HCWs as they are in constant exposure with needle stick injuries.

This study was done as an initial move tending to the deficiency of data on HBV post-vaccination immunity in Vidarbha region. In this study, 126 (73.68 %) of 171 had protective immunity to hepatitis B suggesting our results were compatible with Batra V et al.<sup>10</sup> Zitt E et al.<sup>11</sup> and Souza CL de et al.<sup>12</sup> who showed 70 %, 79.10 % and a slightly lower of 63.8 % protective immunity, respectively. Obiri - Yeboah D et al.<sup>13</sup> Basireddy P et al.<sup>14</sup> and Mahawal BS et al.<sup>8</sup> showed 91 %, 96.5 % and 99.9 % protective immunity, respectively.

In our study, we did not find any association between gender and poor immune response as reported in a study conducted by Muvunyi CM et al. where they found male non responders to be comparatively more than females.<sup>15</sup> But on contrary many other studies highlighted that gender did not play any role in seroconversion. That is, the response of the body to the vaccination does not depend upon the gender.<sup>9,13,14</sup>

Recent manuscripts have established the association of age with decreased Anti-HBs levels and reported that when the age at vaccination was more than 40 yrs., seroconversion to Anti- HBs was higher. But no such findings were relatable in our study, this may be due to the fact that majority of the study population were less than 40 years of age.<sup>9,14,15</sup>

A review paper published in 2017 by Zitt et al.<sup>11</sup> showed various factors that affect the hypo responsiveness of an individual towards hepatitis B vaccination. According to it, chronic states of immunodeficiency leads to low response of an individual towards hepatitis B vaccine. The patients undergoing haemodialysis for CKD had lowest response rate, with only 48 %, due to low immunity, recurrent infections and low protein levels.

We did not find any significant association between increasing BMI with poor immune response, similar to other studies.<sup>9,15</sup> Few studies reported a significant association of BMI with poor immune response.<sup>14</sup>

Smokers have decreased immunity and low immunoglobulins levels and therefore is a state of immunodeficiency. Basireddy P et al. in their study found a strong association between smoking and poor immune response post - Hep B vaccine.<sup>14</sup> Due to less smokers in our study we were unable to evaluate any association.

Zitt E et al. and Souza CL de et al. found the antibody titre was lower when the interval between the last dose of vaccination and the point of time of assessment of immune response was longer.<sup>11,12</sup> though we did not find significant association of immune response with time since last dose. It may be one of the factors for protective immunity in less number of participants in this study as none of the participants had tested for 1 - 2 months after the last dose and many of them did not remember the exact dates of vaccination. There is need of prospective study with large sample size to establish the association of risk factors with the immune response.

## CONCLUSIONS

HCP with risk of occupational exposure to blood or body fluids should get HBV vaccination at the earliest. CDC recommendation of Anti-HBs testing 1 - 2 months post-

vaccination and revaccination should be strictly followed. The study shows that there is a need for booster doses of vaccination in the more vulnerable groups like Health Care Personnel.

Data sharing statement provided by the authors is available with the full text of this article at jemds.com.

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