

SHORT ARTICLE

Anti-HBs Antibodies over time in healthcare workersTanishka Sharma¹, Garima Mittal², Charu Kalra³, Rajiv Kumar Agarwal⁴, Balwant Singh Rawat⁵

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Abstract

Background: In developing countries including India only 18 % HCWs are vaccinated against HBV. In spite of all the recommendations, compliance to vaccination remain poor in majority of health care settings. **Aims & Objectives:** To estimate serum levels of anti-HBs antibodies in healthcare workers and to correlate the values of Anti-HBs level over time in health care workers. **Materials and Methods:** This cross-sectional study was conducted on Health care workers of tertiary care hospital. Their demographic details and hepatitis B vaccination history was recorded as per performa. Serum samples of all the subjects were tested for Anti-HBs levels by VIDAS-PC equipment. **Results:** Out of the 294 HCWs enrolled, 84% (247) were fully vaccinated whereas 16%(47) were partially vaccinated. The vaccination rate was highest among nursing staff (74.9%) followed by doctors (13.8%). 3% of doctors and 12.4% of nurses are still at risk of acquiring HBV infection. On anti -HBs titer estimation, 9.7% of the HCWs had anti-HBs titer < 10 mIU/ml while 90.3% had titre > 10 mIU/ml. **Conclusion:** This study demonstrated that Hepatitis B immunization must be made compulsory for hospital staff in every health care setting as well as to check their anti HBs titres.

Keywords

Hepatitis B Vaccination; Health Care Workers; Anti-HBs Titre

Introduction

Nearly one-third of the global population (> 2 billion people) have been infected with Hepatitis virus B once in their lifetime and about 350 million remain infected for their whole life.(1) There has been a significant decline in morbidity and mortality due to HBV after the availability of HBV vaccine since

1982.(2) Since 1997 CDC has recommended HBV vaccination in all HCWs .(3) According to World Health Organisation (WHO) HBV vaccination rate amongst HCWs ranges from 67-79% in developed countries and 18-39% in developing countries.

Anti-HBs is a protective antibody, its. detection as well as quantification remains the major

determinant of immunity to HBV infection.(4)In the vaccinated individuals there is gradual waning in the anti-HBs titer over time. Hence, both partially vaccinated and even fully vaccinated HCWs might have insufficient anti HBs titers.

There is a hypothesis that with increasing age following vaccination, seroprotective antibody formation declines. It is of great clinical importance as non-responders remain prone to HBV infections. Hence, the post vaccination HBsAb levels should be assessed of all HCWs from infection control perspective. Evaluation of the immunity against HBsAg is needed as certain patients do not build effective anti-HBs antibody levels. Anti HBs titre after vaccination of < 10 mIU/ml is considered as non-response, 10 -100 mIU/ml as hypo-response and > 100 mIU/ml is considered to be fully immune against HBV infection.(5)

Aims & Objectives

To evaluate the immune response of HCWs in our hospital setup after varied duration of last dose of Vaccine for Hepatitis B.

Material & Methods

Study Type, area and duration: “The cross-sectional study was conducted in the Department of Microbiology, Himalayan Institute of Medical Sciences (HIMS), Swami Ram Nagar, Dehradun”, a tertiary care teaching hospital over a period of 5 months from May 2018 to September 2018.

Study population: Subjects were the HCWs of the tertiary care hospital. [Figure 1]

Ethical Approval: Ethical clearance was obtained from Institutional Ethical Committee. All data were handled confidentially and anonymously.

Inclusion criteria: All the relevant clinical, demographical, laboratory and serological data were collected. Doctors, nurses, interns, postgraduates, technicians, housekeeping staff who have received the 3 doses of hepatitis B vaccination and have completed at least 6 months of post vaccination period, were included in the study.

Exclusion criteria: HCWs with history of HBV infection, chronic liver disease, diabetes mellitus, history of steroid therapy for long duration and who had received the last dose of HBV vaccine in last 6 months, were excluded from the study.

Sample collection: Serum specimens from participants were tested at the Microbiology lab of our hospital. 3 ml of venous blood was collected aseptically in a vacutainer. The serum anti HBs level

was quantified by VIDAS-PC Anti-HBs assay which uses the Enzyme Linked Fluorescent Assay principle, combining a two step enzyme immunoassay sandwich method with final fluorescence detection. This is a fully automated system and uses a single – dose, ready-to-use reagent.

Data Analysis: The data was collected and entered in MS Excel 2010. Statistical analysis was performed using SPSS software version 20. The one-sample Kolmogorov-Smirnov Test was employed to determine whether the data sets differed from a normal distribution. Normally distributed data was analyzed using a general linear model analysis of variance (ANOVA), for more than two groups and comparison between two groups unpaired test was applied in normally distributed data. Normally distributed data was analyzed using the Mann Whitney U Test and the categorical data was analyzed using the Chi square Test.

Results

Out of 247 vaccinated participants, 44.9% were males and 55.1% were females, mean age of the vaccinated study group is 30.23 ± 5.690 . Most of the vaccinated and partially vaccinated study group comprised of nursing staff followed by doctors and other HCWs as in [Table 1].The gender wise and age-wise comparison of Anti-HBs titre in HCWs was also done as per [Table 2 & Figure 2] and [Table 3]. There was no significant difference of antibody titre in these groups.

Occupation -wise comparison of Anti-HBs titre in health care workers .12.4 % nursing staff and 2.9% doctors were hypo-responsive (<10mIU/ml) that means they are still at risk of acquiring infection. 2.9 % doctors, 12.4% nurses, 9.09% technicians and 50% ward attendants were in protective range with titre (10-100mIU/ml). 94.1% doctors, 74.9% nurses, 4.45% technicians ,4.85 %ward attendants and 2.02% administrative staff were hyper-responsive (>100mIU/ml). There was significant association between the Anti-HBs titre and occupation of HCWs ($p=0.010$).

While determining the persistence of protective antibody level, we found that 92.5% of participants had protective levels of antibody within 5 years of vaccination and 83.3% had protective levels even after 5years.while 7.5% came to be hypo-responsive in post-vaccination duration of < 5 year and 16.7% in >5-year duration. These findings were found to be statistically significant ($p=0.036$)

Discussion

Healthcare workers are frequently exposed to many blood-borne infections including HIV, Hepatitis B, and Hepatitis C viral infections. Among these HBV infection is one that can be prevented by vaccination. HBV vaccination coverage is considerably low among healthcare workers in developing countries. HBV infection is considered to be the most important occupational hazard among HCWs both in terms of morbidity and mortality.

Out of the 294 healthcare workers enrolled in the study, 84% (247) were fully vaccinated whereas 16% (47) were partially vaccinated who had generally missed their third dose. In a study conducted by Batra *et al.*, 49.6% vaccinated and 4.3% partially vaccinated subjects had been reported.(6)

Among the fully vaccinated individuals, female predominance was observed with female to male ratio being 1:0.816; 44.2% males and 55.8% females. Out of the 55.8% (164) females, 55.1% (136) were fully vaccinated and 59.6% (28) were partially vaccinated however among 44.2% (130) males, 44.9% (111) were fully vaccinated and 40.4% (19) were partially vaccinated. Female preponderance similar to our study has been reported by Rao *et al.*,(7) whereas Mahawal *et al.* has reported male predominance.(8)The mean age of our study population was 30.26 years and majority 43.5 % were in the age group of 26 -30 years followed by 19.04% in 20-25 years and only 6.1% were above 40 years. Mean age of 33.5 years and adult preponderance similar to our study had been observed by Lakshmanan *et al.*,(9) and Nashibi *et al.*, has also reported their study group mean age as 31.9 years (10) whereas Das *et al.*, has reported 44.6 years as the mean age of their study group.(11)

Among the various groups of vaccinated healthcare workers, the vaccination rate was highest among nursing staff (74.9%) followed by doctors (13.8%), housekeeping staff (4.9%) laboratory technician (4.5%) and administrative staff (2%) while in the study conducted by Batra *et al.*, 92.4% doctors, 41.7% nursing staff, 24.2% laboratory technicians and none of the grade 4 staff were vaccinated. Such kind of variation among the vaccination in various groups of HCWs was probably due to difference in enrolment of the healthcare workers as per their nature of work and probably the lack of knowledge regarding the importance of vaccination in groups other than doctors and nurses who are in direct contact with the

patient.(6)The factors influencing the immune response like gender, smoking and obesity has been established in literature and Mac Mahan *et al.* reported that male had higher antibody level than females.(12)Comparison was done to analyse the effect of gender on Anti-HBs titre and we have observed 89.18% males and 91.17% females had protective level of antibody titre. We did not find any significant association between Anti-HBs levels with gender ($p=0.394$). Our results were in concordance with the study conducted by Sahana *et al.* (13) and Baghianimoghadam *et al.* (14) that Anti-HBs production was not affected by sexual factors such as feminine hormones. Another study by Mohd. Abdul in Bangladesh also showed protective level of anti HBs antibody in 85.88% males and 92.31 % of females. (15)

Observations by Das *et al.* favoured the hypothesis of decreasing seroprotective antibody titre with increasing age likewise many other studies. (11)

Seroconversion rate was almost 85% in younger individuals whereas 57% in individuals more than 40 years of age in our study. However, association between the age group and immune response cannot be commented as we have enrolled more individuals in the younger age group.

In our study surprisingly 2.9% of doctors and 12.4% of nurses had Anti-HBs titre <10mIU/ml while rest 97.05 % doctors and 87.56% nurses had an Anti-HBs titre >10mIU/ml (protective titre). This showed that approx. 3% of doctors and 12.4% of nurses are still at risk of acquiring HBV infection. In a similar study by Batra *et al.* who reported 30 % of their study cohort to be at risk of acquiring HBV infection.(6) In previous studies, Alimonos *et al.*,(16) Zeeshan *et al.*,(17) and Nashibi *et al.*,(10) good antibody response was reported at 92%, 86% and 78.6% respectively, which were in concordance with our results.

On anti HBs titer assessment, 9.7% of the HCWs had anti-HBs titer < 10 mIU/ml while 90.3% had titre > 10 mIU/ml. The titre was significantly higher in individuals who had been immunized in the previous 5 years as compared to those who have been vaccinated more than 5 years ago. Similar significant association had been reported by Batra *et al.* but they have observed 30% of their cohort to have anti HBs titer < 10 mIU/ml while 70 % had titre > 10 mIU/ml.(6)

In many western countries it has been made mandatory that before entering any healthcare settings, HBV vaccination should be recorded for

medico-legal purposes and non-vaccinated must be immunized before joining.(18) Our hospital infection control committee (HICC) is continuously creating awareness among all HCWs regarding the importance of HBV vaccination and the need of anti HBs titre at required intervals to know their immune status and to assess the need of booster dose if required. Seroprotective titer in 90.3% of HCWs suggest good efficacy of the vaccination program as well monitoring of immune status of the HCWs.

Conclusion

All blood and body substances being highly infectious in transmitting blood borne viruses. One of the major causes of accidental exposure to these viruses is inappropriate handling of sharps. Standard precautions and infection control practices must be implemented in all health-care settings. Clinicians and other HCWs regularly involved in exposure-prone procedures must be tested for human immunodeficiency virus (HIV), hepatitis C virus (HCV) and HBV. One of the important infection control strategy to prevent HBV is vaccination. All HCWs must be vaccinated and should be aware of their vaccination status as well of the immune response. Any exposures to blood and body substances must be immediately reported to HICC. All the tests of the exposed HCWs must be performed, documented and confidentiality must be maintained. HCWs infected with HIV, HBV or HCV must be restrained from performing exposure-prone procedures.

After assessing the seroconversion rate of HCWs following the three doses of HBV vaccination we conclude that hepatitis B immunization must be made compulsory for hospital staff in every health care setting as well as it is equally important to check the anti HBs titre after 6–8 weeks of vaccination. This will guide the clinician regarding the immune status as well as the need for a booster dose. This will not only ensure the safety of the employees but also reduces rate of transmission in the health care settings

Recommendation

During the conduct of study, a general awareness was created among HCWs by providing information about the need for HBV vaccination and importance of doing antibody titres.

Limitation of the study

The sero-conversion rate after revaccination of the non responders was not available due to the short

time period of the study as higher seroconversion rate after revaccination has been reported in many studies earlier.

Relevance of the study

This study emphasizes that every hospital should implement policy to vaccinate all their employees at the time of recruitment and their post-vaccination antibody titres must also be checked.

Authors Contribution

Conception and design of study: TS, GM: Generation of data: TS, GM, BSR: Interpretation of data: TS, GM, CK, RKA, BSR: providing intellectual inputs: TS, GM, CK, RKA, BSR

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Tables

TABLE 1: STUDY GROUP ACCORDING TO DIFFERENT DEMOGRAPHIC DETAILS AND VACCINATION STATUS

S.NO	CATEGORY (n= 294)	VACCINATED n (%)	PARTIALLY VACCINATED n (%)	Total subjects n (%)	p VALUE
1.	Age (mean ±- SD)	30.23 ± 5.7	30.49 ± 6.1	30.26±5.8	0.775
2.	Sex				0.568
	Male	111(44.9)	19(40.4)	130(44.2)	
	Female	136(55.1)	28(59.6)	164(55.8)	
3.	Healthcare workers				0.001
	Doctors	34(13.8)	17(36.2)	51(17.3)	
	Nursing staff	185(74.9)	21(44.7)	206(70.1)	
	laboratory Technicians	11(4.5)	3(6.4)	14(4.8)	
	Housekeeping Staff	12(4.9)	5(10.6)	17(5.8)	
	Administrative Staff (Clerks/Assistant/In charge)	5(2.0)	1(2.1)	6(2.0)	
	Total	247(84.0)	47(16.0)	294	

TABLE 2: AGE WISE COMPARISON OF ANTI-HBS TITRE IN HCWS

S.no.	Age (years)	Anti HBS titre			Total	p value
		<10IU/ml n (%)	10-100IU/ml n (%)	>100IU/ml n (%)		
1.	20-25	5(10.2)	4(8.2)	40(81.6)	49(19.8)	0.372
2.	26-30	9(8.65)	15(14.4)	80(76.9)	104(42.10)	
3.	31-35	5(9.8)	3(5.9)	43(84.3)	51(20.6)	
4.	36-40	3(10.3)	5(17.2)	21(72.4)	29(11.7)	
5.	>40	2(14.3)	4(28.6)	8(57.1)	14(5.7)	
	Total	24 (9.7)	31 (12. 5)	192(77.8)	247	

TABLE 3: OCCUPATION WISE COMPARISON OF ANTI- HBS TITRE AMONG HEALTH CARE WORKERS

S.no.	Occupation	Anti -HBs titre			Total	p value
		<10IU/ml N = (%)	10-100 IU/ml N= (%)	>100IU/ml N= (%)		
1.	Doctors	1(2.9)	1(2.9)	32(94.1)	34(13.8)	0.010
2.	Nurses	23(12.4)	23(12.4)	139(75.1)	185(74.9)	
3.	Technical staff	0(0)	1(9.09)	10(90.9)	11(4.45)	
4.	Ward attendant/house keeper	0(0)	6(50)	6(50)	12(4.85)	
5.	Administrative staff (clerks/assistant/in charge)	0(0)	0(0)	5(100)	5(2.02)	
	Total	24 (9.7)	31(12.5)	192(77.8)	247	

Figures

FIGURE 1 STUDY POPULATION

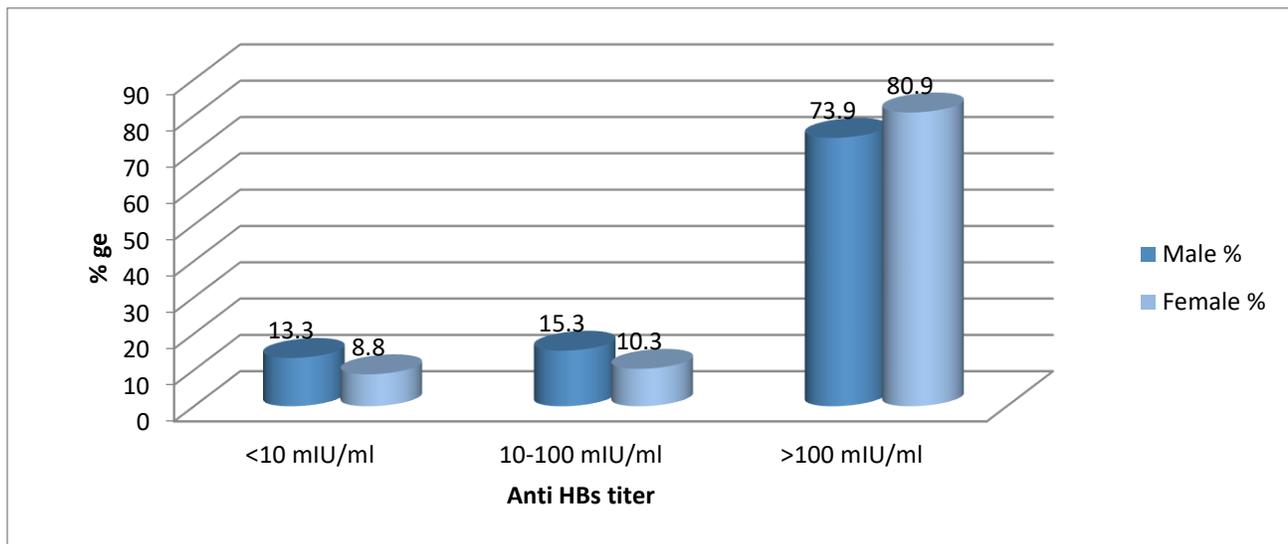


FIGURE 2 GENDER WISE COMPARISON OF ANTI HBS ANTIBODY TITRE IN HCW

