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Research Article

Baseline Anti-HBs Antibody Titre in Health Care Workers in a Tertiary Health Care Centre in Faridabad, India

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A B S T R A C T

Introduction: Healthcare workers (HCWs) are at a high risk of acquiring hepatitis B virus (HBV) infection through occupational exposure which is preventable through hepatitis B vaccination.

Aims: Therefore, we aim to establish the seroprevalence of anti-Hepatitis B surface (anti-HBs) antibody in the HCWs in a tertiary care setup to assess the level of protection that workers in these high-risk zones have.

Methods and Material: Serum specimens from participants were tested at the Microbiology laboratory of ESIC Medical College & Hospital, Faridabad. Three ml of venous blood was collected aseptically in a vacutainer. The serum anti-HBs titre was detected by Enzyme-linked immunoassay (ELISA) using the Monolisa Anti-HBs PLUS (Bio-Rad) as per manufacturer's instruction.

Results: Of the 218 HCWs included, 145 (66.51%) were vaccinated, and 73 (33.49%) were unvaccinated. HCWs were grouped into five categories which comprise doctors from all disciplines (n=53), nursing staff (n=50), technicians (n=52), nursing orderly (NO) (n=34),and housekeeping (n=29). Among various groups of HCWs, the vaccination rate was highest among doctors (96.23%) than the other groups. While comparing the anti-HBs titre among the unvaccinated HCWs, it has been seen that out of 73 (33.49%) HCWs, majority of the NO (76.47%) were having titre below 10 mIU/ml followed by housekeeping (73.68%), technicians (70.58%), and nursing staff (33.33%).

Conclusions: All HCWs should be regularly screened for HBs antigen along with administration of a booster dose and monitoring of anti-HBs titre.

Keywords: Hepatitis B Vaccination, Booster, Hepatitis B Surface Antibody Titre

Introduction

Nearly one-third of the global population (> two billion people) have been infected once in their lifetime with Hepatitis B virus (HBV) and about 350 million remain infected for their whole life.[1] Hepatitis B infection is one of the most important occupational hazards among healthcare workers (HCWs) and medical students. HBV is highly contagious which gets transmitted by injuries with contaminated sharp objects like needles and by exposure to infected blood or body fluids. HCWs are four times more at risk of contracting hepatitis B infection compared to the general population due to frequent handling of blood and body fluids of patients.[2] The risk of acquiring this infection following a single exposure among the non-vaccinated individuals ranges within 6–30%. According to World Health Organisation (WHO), 5.9% of HCWs are exposed annually to blood-borne HBV infections which correspond to about 66,000 worldwide.[3]

The risk of HBV transmission is more among paramedics and yet they receive HBV vaccination less often than doctors.[4,5] Moreover, among HCWs in developing countries, the basic precautions like using goggles, gloves, and safe disposal of needles, are found lacking.[6,7]

As a part of occupational safety measures, all HCWs are recommended to a compulsory vaccination against HBV.[8] However, only 18% of HCWs of South East Asia including India are vaccinated[3,9] due to poor awareness in this group, as per the estimates by WHO.

There has been a significant decline in morbidity and mortality due to HBV after the availability of HBV vaccine since 1982. Since 1997, Centres for Disease Control and Prevention (CDC) has recommended HBV vaccination for all HCWs.[10] According to WHO, HBV vaccination rate amongst HCWs ranges from 67% to 79% in developed countries and from18% to39% in developing countries.[11] It is essential to test for evidence of protective immunity to HBsAg vaccination, as some vaccinated HCWs do not develop sufficient levels of antibodies against HBsAg (anti-HBs).[12] An anti-HBs level of ≥ 10 mIU/ml is considered as protective against HBV infection.[13] An anti-HBs titre of < 10 mIU/ml is regarded as non-responsive to HBV vaccination.[14] To attain protective blood titres, these non-responders should undergo revaccination.

We undertook a cross-sectional study to establish the seroprevalence of anti-HBs in the HCWs in a tertiary care set-upto assess the level of protection that workers in these high-risk zones have. The subjects for the study were all types of HCWs ranging from physicians, surgeons, residents, operating room technicians, laboratory technicians, nurses, nursing orderly (NO), and housekeeping staff.

Material and Methods

This cross-sectional study was conducted over a period of six months to analyse the status of HBV immunisation among HCWs in the department of Microbiology. The study was approved by the Institute Ethics Committee. A total of 218 HCWs were included in the study. After written consent, HCWs received counselling and explanation on the objectives of the study by a qualified medical doctor. A standard questionnaire was used in order to get a detailed personal history of the participants, and three mL of blood sample was collected from each of them. Demographic details of HCWs including age, gender, and occupation along with the details of their hepatitis B vaccination were incorporated in the personal health information.

HCWs who were positive for hepatitis B surface antigen (HBsAg) were excluded from the study. The use of universal precautions in daily practice was also taken into account. Patients were classified on the basis of HBV vaccination status. Vaccinated group included the subjects who had received three doses of HBV vaccination at 0, one, and six months; partially vaccinated group had received either single or two doses, and unvaccinated group included those who had received no dose of HBV vaccination.

Assessment of Anti-HBsAg Titre

Serum specimens from participants were tested at the Microbiology laboratory of our hospital. Three ml of venous blood was collected aseptically in a vacutainer. The serum anti-HBs titre was detected by Enzyme-linked immunoassay (ELISA) using the Monolisa Anti-HBs PLUS (Bio-Rad) as per the manufacturer's instruction.

Statistical Analysis

Parametric data are expressed as mean values ± standard deviation (SD) and categorical variables as percentages. The chi-square test was used for the comparison of dichotomous variables and the Student's t-test for continuous variables. ANOVA one-way was used to calculate P values for comparisons of more than two continuous variables. A p value <0.05 was considered as statistically significant. All data were analysed by SPSS version 25 statistical package.

Results

Out of 218 participants, 45.41% were males and 59.59% were females. The mean age of the vaccinated study group was 30.34 ± 5.99. HCWs were grouped into five categories according to the nature of work they performed at the medical college. The categories included doctors from all disciplines (n=53), nursing staff (n=50), technicians (n=52), NO (n=34); and housekeeping (n=29) (Table 1). Of the 218 HCWs included, 145 (66.51%) were vaccinated, and 73 (33.49%) were unvaccinated (Figure 1). Out of 145 fully

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vaccinated individuals, female predominance was observed; 42.06% (61) were males and 57.93% (84) were females. Among various groups of HCWs, the vaccination rate was highest among doctors (96.23%) (Figure 2) followed by technical staff (35;67.31%), nursing staff (32;64.0%), nursing orderly (17;50.0%), and housekeeping staff (10;34.48%) (Table 1). It was evident that more doctors were vaccinated as compared to the paramedical staff (p< 0.01).

Occupation-wise comparison of anti-HBs titre in vaccinated health care workers revealed that 10% of housekeeping staff, 9.80% of doctors, and 2.85% of technicians were hypo-responsive (<10 mIU/ml),which means that they were still at risk of acquiring infection. 90.19% of doctors, 100% of nursing staff, 100% of NO, 97.14% of technicians, and 90% of housekeeping staff were in the protective range with titre ≥10 mIU/ml. There was no significant association between anti-HBs titre of the participants with their occupation and age (Tables 2 and 3).

While comparing the anti-HBs titre among the unvaccinated HCWs, it has been seen that out of 73 (33.49%) HCWs, majority of the NO (76.47%) were having titre below 10 mIU/ml followed by housekeeping (73.68%), technicians (70.58%), and nursing staff (33.33%). However, there were two doctors whose anti-HBs titre was less than the protective level (Table 4).

One of the interesting findings in this study was that 11.92% (26/218) of HCWs who were unvaccinated have shown titres above 10 mIU/ml. Furthermore, among the 26 individuals, 16 (61.53%) had titres >100 mIU/ml. Among these HCWs, majority were nursing staff (12, 46.14%), who had anti-HBs titre ≥10 mIU/ml despite being unvaccinated (Table 5).

Table 1.Baseline Characteristics of Study Population

Category	Total	Vaccinated	Unvaccinated	p-value
N	218	145 (66.51%)	73 (33.49%)	
Age (M±SD)	30.39 ± 5.75	30.34 ± 5.99	30.58 ± 5.32	
Sex				
Male	99	61 (61.62%)	38 (38.38%)	0.21
Female	119	84 (70.59%)	35 (29.41%)	
Age (years)				
≤ 25	36	26 (72.22%)	10 (27.78%)	0.55
26 - 30	92	58 (63.04%)	34 (36.96%)	
31 - 35	52	33 (63.46%)	19 (36.54%)	
> 35	38	28 (73.68%)	10 (26.32%)	
HCWs				
Doctor	53	51 (96.23%)	2 (3.77%)	<0.01
Nurse	50	32 (64%)	18 (36%)	
NO	34	17 (50%)	17 (50%)	
Technician	52	35 (67.31%)	17 (32.69%)	
Housekeeping	29	10 (34.48%)	19 (65.52%)	

N:number of participants, %: percentage of participants, M: mean, SD: standard deviation, HCWs: health care workers, NO: nursing orderly.

Table 2.Occupation wise Comparison of Anti-HBs Titre among the Vaccinated HCWS

S. No.	Categories of HCWs	Anti-HBs Titre ≥10 mIU/ml N (%)	Anti-HBs Titre<10 mIU/ml N (%)	Total	P value
1.	Doctor	46 (90.19)	5 (9.80)	51	0.19
2.	Nursing staff	32 (100)	0	32	
3.	NO	17 (100)	0	17	
4.	Technicians	34 (97.14)	1 (2.85)	35	
5.	Housekeeping	9 (90)	1 (10)	10	
	Total	138 (95.17)	7 (4.82)	145	

N:number of participants, %: percentage of participants, Anti-HBs: Hepatitis B surface antibody.

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Table 3.Age-wise Comparison of Anti-HBs Titre among the Vaccinated HCWS

S. No.	Age (years)	Anti-HBs Titre ≥10 mIU/ml N (%)	Anti-HBs Titre<10 mIU/ml N(%)	Total	P value
1.	≤ 25	2 (7.69)	24 (92.3	26	0.823
2.	26 - 30	56 (96.55	2 (3.44	58	
3.	31 - 35	31 (93.93	2 (6.06	33	
4.	> 35	27 (96.42	1 (3.57	28	
	Total	138 (95.17	7 (4.82	145	

N:Number of participants, %:percentage of participants, Anti-HBs: Hepatitis B surface antibody.

Table 4.Occupation wise Comparison of Anti-HBs Titre among the Unvaccinated HCWS

S. No.	Categories of HCWs	Anti-HBs Titre ≥10 mIU/ml N (%)	Anti-HBs Titre <10 mIU/ml N (%)	Total	P value
1.	Doctor	0	2 (100)	2	0.02
2.	Nursing staff	12 (66.66)	6 (33.33)	18	
3.	NO	4 (23.52)	13 (76.47)	17	
4.	Technicians	5 (29.41)	12 (70.58)	17	
5.	Housekeeping	5 (26.31)	14 (73.68)	19	
	Total	26 (35.61)	47 (64.38)	73	

N: Number of participants, %:percentage of participants, Anti-HBs: Hepatitis B surface antibody.

Table 5.Distribution of Unvaccinated HCWs with Anti-HBsAg Titre ≥10 mIU/ml

S. No.	Categories of HCWs	Anti-HBs Titre 10-100 mIU/ml N (%)	Anti-HBs titre ≥ 100 mIU/ml N (%)	Total
1.	Nursing staff	4 (33.33)	8 (66.66)	12
2.	NO	1 (25)	3 (75)	4
3.	Technicians	3 (60)	2 (40)	5
4.	Housekeeping	2 (40)	3 (60)	5
	Total	10 (38.46)	16 (61.53)	26

N:Number of participants, %:percentage of participants, Anti-HBs: Hepatitis B surface antibody.

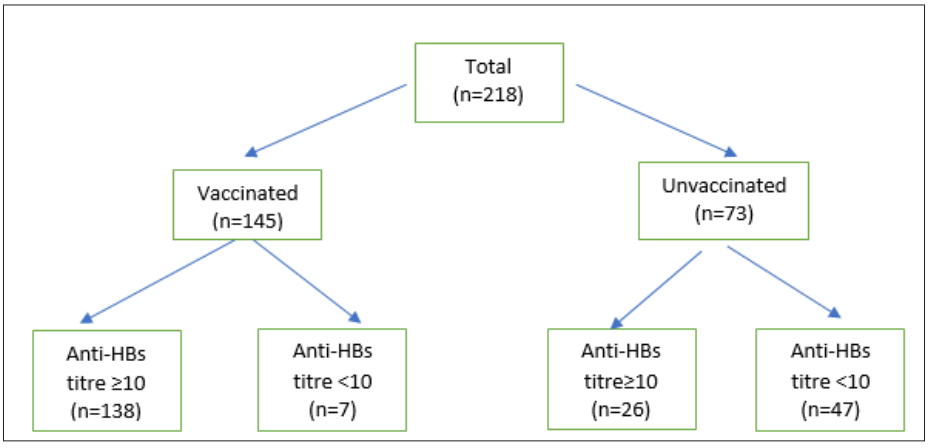

Figure 1.Recruitment of Subjects, Hepatitis B Surface AntibodyTitre

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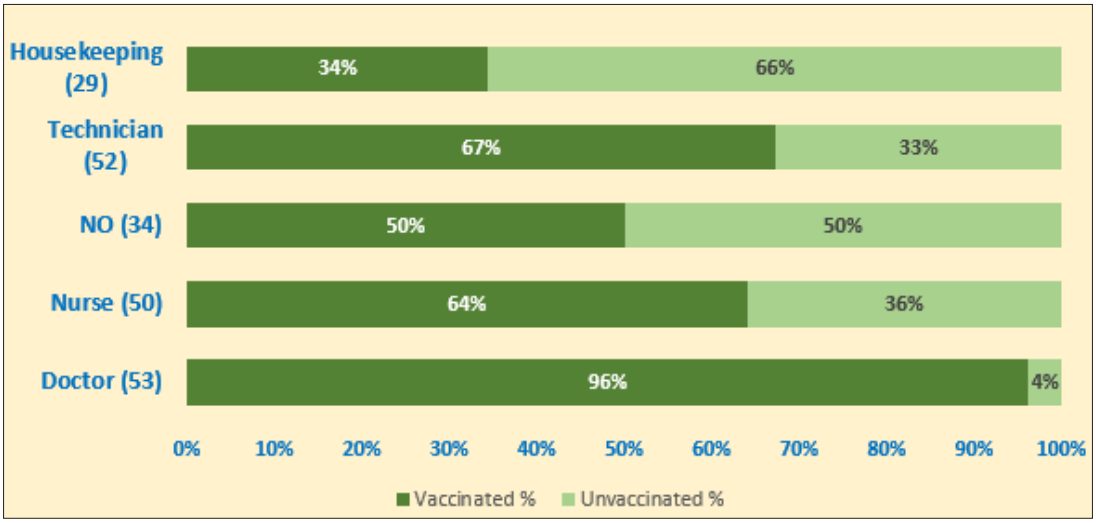

Figure 2.Hepatitis B Vaccination Status among Healthcare Workers

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. Vaccination is effective in protecting 90-95% of the adults.[15] HBV vaccination coverage is considerably lower 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. According to WHO estimates, HBV vaccination coverage among HCWs varies from 18% (Africa) to 77% (Australia and New Zealand).[3]

In the present study, out of 218 HCWs, one third (33.49%) of the participants were not vaccinated. A similar study done in New Delhi showed that 44.6% of HCWs were not vaccinated against HBV.4 A higher incidence of unvaccinated HCWs, 46.1% and 57.59% respectively, were observed by Batra et al. and Kumar et al.[16,17]

In this study, it has been observed that none of the vaccinated HCWs had documentation of their anti-HBs titre. As per WHO, the documentation of anti-HBs titre is very important and if it is not documented, the three-dose vaccination series should be administered. Post vaccination testing should be performed 1-2 months after the three-dose series. There is no harm in receiving extra doses of the vaccine.[11] CDC also says that vaccination information should be entered into the hospital information system, if available. HCW should be provided a copy of Hepatitis B vaccination and anti-HBs testing results, and should be encouraged to keep them with their personal health records so that they can readily be made available to future employers.[18]

In the present study, vaccination coverage among the doctors was highest (96.23%), as compared to other categories of HCWs. A similar study conducted by Batra et al.,[16] showed that92.4% of doctors, 41.7% of nursing staff, 24.2% of laboratory technicians and none of the grade 4 staff were vaccinated. However, in our study, 34.48% of the housekeeping staff and 50% of the nursing orderly 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 patients. Socio-economic status may also be an additional factor.

In our study, 10% of housekeeping staff, 9.80% of doctors, and 2.85% of technicians were non-responders (<10mIU/ml) while rest 90% of housekeeping, 90.19% of doctors and 97.14% of technicians had an anti-HBs titre>10mIU/ml (protective titre). This showed that approximately 10% of doctors, 10% of housekeeping and 3% of technicians were still at the risk of acquiring HBV infection. It has been seen that this unresponsiveness to recombinant hepatitis B vaccine may be due to non-response or waning of vaccine-induced immunity caused by inadequate Th1- and Th2-like cytokine production.[19] A similar study by Batra et al.16has reported 30% of their study cohort to be at the risk of acquiring HBV infection. In a previous study by Alimonos et al., good antibody response was reported at 92%, which were in concordance with our results.[20]

Non-responders with HBsAg negative status are considered susceptible to HBV infections and are therefore advised to take all precautions and Hepatitis B immunoglobulin G (HBIG) in case of known or possible exposure to HBV-infected patient. The two-dose HBIG regimen would be the better choice. The first dose of HBIG (0.06mL/kg) should be given as soon as possible after exposure and the second dose (same dosage) should be given one month later.[21]

We found in our study that among the HCWs who were previously vaccinated, 95.17% had protective titre.

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Surprisingly, 35.61% of the unvaccinated subjects had anti-HBs titres above 10 mIU/ml. A similar result was seen in some other studies from India.9 This finding reiterates the fact that most of the healthcare workers are still ignorant or unaware about vaccination against hepatitis B virus and are prone to infection through blood and other body fluid exposure. Nursing staff were the highest (12; 46%) among the unvaccinated HCWs whose protective titre was ≥ 10 mIU/ml. This may be due to more exposure and less knowledge of standard precaution and infection control practices.

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 immunised before joining. Sero-protective titre in 90.3% of HCWs suggests good efficacy of the vaccination programme as well as monitoring of immune status of the HCWs.[22]

Conclusion

Incessant efforts are being made by our hospital infection control committee (HICC) to create awareness among all HCWs regarding the need of HBV vaccination. The crucial importance of anti-HBs titre at required intervals to know their immune status and to assess the need of booster dose if required, are also being stressed upon. The knowledge about vaccination, checking antibody titre regularly and screening for HBs antigen should be made compulsory for HCWs.

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