



**ESTIMATION OF HEPATITIS B VACCINATION STATUS ALONG WITH
ASSESSMENT OF AWARENESS AND PREVENTIVE MEASURES ADOPTED
REGARDING HEPATITIS B INFECTION AMONGST HEALTH CARE WORKERS OF A
TERTIARY CARE HOSPITAL IN MIDDLE ASSAM**

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ABSTRACT

Background: Healthcare workers are still frequently exposed to the risk of hepatitis B. In India, the prevalence of HBsAg prevalence among the general population ranges from 2 to 8 percent, which places India in an intermediate HBV endemicity zone. India, with 50 million cases, is also the second-largest global pool of chronic HBV infections. Vaccination against hepatitis B is an essential strategy to control HBV infection. Anti-HBs is a protective antibody, its detection, as well as quantification, remains the primary determinant of immunity to HBV infection. **Aims:** To determine the antibody titre of hepatitis B in healthcare workers, their need for revaccination of the Hepatitis B vaccine and to check for their general awareness for prevention in a tertiary care hospital. **Materials and methods:** The study was conducted in the Department of Microbiology, TMCH over a period of one year. 484 HCWs participated in the study. HBsAg screening of the HCWSs was done by Rapid HBsAg card and ELISA for anti-HBs titre estimation. KAP was analysed by self-administered structured questionnaire. **Results:** In our study, we found that out of 484 HCWs who participated in study, 260 (53.71%) healthcare workers were fully vaccinated. The overall protective titre amongst all categories of HCWs was 95.76% and a significant correlation was found between knowledge score with preventive practice scores. **Conclusion -** The healthcare workers engaged in Tertiary care hospitals are at risk while performing their job. It is therefore very important for healthcare workers to get vaccinated. Strict preventive measures should be followed by the HCWs for effective protection against HBV infection and transmission.

KEYWORDS: Healthcare Workers (HCWs), Hepatitis B surface Antigen (HBsAg), Anti HBs, Knowledge, Attitude, Practice.

INTRODUCTION

The broad term "hepatitis" refers to liver inflammation. The most common cause is infection with one of the five viruses called Hepatitis A, B, C, D, and E. Of the five viral causes, hepatitis B infection is the world's most common liver infection, which is caused by the hepatitis B virus (HBV). HBV is a DNA virus measuring 42–47 nm in diameter and enters the liver through the bloodstream. HBV is highly contagious and is 50–100 times more infectious than HIV. It is transmitted through blood, semen, vaginal fluid, and mucous membranes. It is transmitted most by unprotected sexual contact, contaminated blood transfusions, unsafe use of needles, vertical transmission from mother to child, and close household contact, among children.^[1] Healthcare workers are still frequently exposed to the risk of hepatitis B. A recent study performed in the United States on exposures to blood-borne pathogens in workers

requiring training for universal precautions showed that the annual incidence of reported exposures was 93.7/1000, and the sources were 4.4% positive for HBV.^[2] It was believed that bad living conditions, mainly during wars, generated jaundice. In 1885, Lurmann observed an outbreak of jaundice 2–8 months after people had been given the smallpox vaccine. This outbreak was probably caused by the hepatitis B virus since the vaccine had been prepared from human lymph.^[3] In India, the prevalence of HBsAg prevalence among the general population ranges from 2 to 8 percent, which places India in an intermediate HBV endemicity zone. India, with 50 million cases, is also the second-largest global pool of chronic HBV infections.^[4] Vaccination against hepatitis B is an essential strategy to control HBV infection. The unanticipated discovery of "the Australia antigen" in 1964, which was designated as "hepatitis-associated antigen" in 1969 and was

meticulously changed to hepatitis B surface antigen (HBsAg) in 1972 after visualization of Dane particles (HBV virions) with an electron microscope in 1970, opened the way to develop hepatitis B vaccine.^[5] The HBV vaccine is composed of a recombinant HBV surface antigen (HBsAg), which induces specific antibodies (anti-HBs) and confers 95% protection for >20 years.^[6] HBV infection is a blood-borne disease affecting around 2 billion people worldwide, of which about 350 million develop chronic hepatitis, cirrhosis of the liver, and hepatocellular carcinoma.^[7] If HBV infection is not treated adequately, it can have serious sequelae such as liver cirrhosis and hepatocellular carcinoma.^[8-10] One of the significant health hazards to healthcare workers is the occupational transmission of potentially contagious viruses, including HIV, Hep B, and Hep C viruses. WHO reported 2.5% of all HIV, 40% of Hepatitis B, and 40% of Hepatitis C infections due to occupational transmission.^[11] 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 an infection control perspective. Evaluation of the immunity against HBsAg is needed as certain patients do not build sufficient 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 fully immune against HBV infection.^[12] According to WHO, the 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 primary determinant of immunity to HBV infection.^[13]

AIM AND OBJECTIVES

To determine the antibody titre of hepatitis B in healthcare workers, their need for revaccination of the Hepatitis B vaccine and to check for their general awareness for prevention in a tertiary care hospital.

MATERIALS AND METHODS

This hospital based prospective observational study was conducted in the Department of Microbiology, Tezpur Medical College & Hospital, Tezpur, Assam. 510 healthcare workers were selected randomly from the hospital employee list of 1020 regular employees. 484 consented to participate and the rest did not participate. The ethical approval was obtained from Institutional Human Ethical Committee (No. 073/2021/TMCH) and written informed consent was taken from all patients.

Inclusion criteria

- Healthcare workers who had received three complete doses of the Hepatitis B vaccine.

Exclusion criteria

- Healthcare workers whose immunization status is not known or not completely immunized.
- Health care workers who were found to be HBs Ag reactive with rapid screening kit test.

METHODOLOGY

Healthcare workers (HCWs) included medical students, doctors, nurses, technicians, and ward boys according to the fulfilment of the exclusion and inclusion criteria. A detailed personal history of the participants including age, gender, marital status, type of HCWs education levels, and their Hepatitis B vaccination was obtained in a self-structured questionnaire. The Health care workers were divided into two categories based on their vaccinated status i.e., vaccinated HCWs and non-vaccinated HCWs. Only those healthcare workers who have taken 3 doses of the Vaccines at 0, 1 & 6 months were classified as vaccinated. A questionnaire to assess their knowledge of the Hepatitis B virus, preventive measures, and attitude was given to each participant. The Anti HBs Ag titre estimation was done in the CCL & VRDL section of the Department of Microbiology, Tezpur Medical College & Hospital. The surface antigen screening of the HCWSs was done by Rapid HBsAg card kit of SD BIOSENSOR company, Gurugram, Haryana following the protocol provided along with the kit. All those HCWs who were tested as negative HBsAg after the Rapid Antigen test were selected for further ELISA anti-HBs titre estimation as per the study plan. The ELISA was done for the quantitative determination of antibodies to the Hepatitis B surface antigen in human serum by DIA.PRO Diagnostic KIT (Bioprobes Srl Italy). After plotting the ELISA reading on the standard curve, the anti-HBs titres were obtained. Healthcare workers with antibody titre 10 IU/ml or above will be considered to have a protective response to the vaccine and those below 10 IU/ml will be considered to be hypo responsive to the vaccine. The Results of Anti HBs Ag titre and the Knowledge. The attitude and Practices of the HCWs were obtained, statistically analyzed, and discussed. The Data collection to assess the preventive measures amongst HCWs was done by a self-administered structured questionnaire with close-ended answers having equal marks. A total of 11 questions were asked to the participants. This was done to assess the knowledge (11 questions), attitude (4 questions) and preventive practices (4 questions) HBV amongst the HCWs.

RESULTS AND DISCUSSION

The health care workers are associated with various chances of contact with body fluids which makes them more vulnerable and hence greater risk of contracting blood-borne. Diseases like Hepatitis B and HIV. The risk of occupational HBV infection is 3 to 5 times higher than for the general population. The risk increases with the length of employment and age.^[14] The risk of acquiring HBV is 16-30% more in comparison to the general population.^[15] Hepatitis B vaccination is effective in

protecting 90-95% of adults.^[16] This study was conducted in TMCH which is a tertiary care hospital in the Middle part of Assam. So, the chances of contracting the viral infection are higher as a blood-borne infection. It is evident that any persons who have to work in conditions that have increased contact with blood, different body fluids, and also sharp contaminated items should be vaccinated against hepatitis B.^[17]

Estimates of Hepatitis B vaccine coverage among Health care workers are needed to calculate the proportion susceptible to HBV infection. Unfortunately, the practice of vaccination is not yet well accepted. According to

WHO estimates Hepatitis B vaccination coverage among healthcare workers varies from 18% being the lowest in Africa and 77% in Australia and New Zealand.^[18]

In our study, we found out that out of 484 HCWs who participated in study, 260 (53.71%) healthcare workers were fully vaccinated. The Mean age (Mean \pm SD) of the HCWs was 30.02 \pm 10.60 years. (Table 1) The proportion of HCWs who got vaccinated was comparable to a similar study done in G.B Pant Hospital in Delhi by Sukriti et al. where 55.4% of the HCW were found to be vaccinated.^[19] The study by Sukriti et al comprised four tertiary care hospitals.

Table 1: Baseline and demographic characteristics of the study participants. (N –Number of participants, M-Mean, SD-Standard deviation).

Characteristics	Total	Vaccinated	Unvaccinated	p-value
N	484	260 (53.71%)	224 (46.28%)	
Age (M \pm SD)	30.02 \pm 10.60	30.33 \pm 11.14	29.66 \pm 9.92	
Sex				
Male	271 (56.0%)	134 (27.68%)	137 (28.30%)	0.24
Female	213 (44.0%)	126 (26.03 %)	87 (17.97 %)	
Age (years)				
\leq 25	81 (16.74%)	46 (17.69%)	35(15.62%)	0.244
26-30	203 (41.94%)	104 (40.0%)	99 (44.19%)	
31-35	115 (23.76%)	57 (21.92%)	58 (25.89%)	
>35	85 (17.65 %)	53 (20.38%)	32 (14.28%)	
HCWs				
Doctors	108 (22.31%)	101 (38.85%)	07(3.13%)	<0.001
Nurses	135 (27.89%)	85 (32.69%)	50 (22.32%)	
Lab. technician	102 (21.07%)	46 (17.69%)	56 (25.0%)	
Ward & Grade IV	85 (17.56%)	17 (6.53%)	68 (30.36%)	
Cleaners	54 (11.15%)	11 (4.23%)	49 19.0%)	

A similar study by Batra et al. showed that the unvaccinated HCW was 46.21% which is almost like our study where the unvaccinated HCW was 46.28%.^[20] In our study vaccination coverage amongst the Doctors was 93.51%. Amongst the Nurses, it was found to be 62.96%. Similarly, it was 45.09%, 20.00%, and 20.37% among Technicians, Ward boys cum Grade IV, and Cleaners respectively. The vaccination rate among Doctors was around 92.4% (Table 1)

The findings of the study by Batra et al., in Dr. Sampurnanand Medical College in Jodhpur, India is comparable to our study. The Vaccination amongst the Ward boys, Grade IV staff, and Cleaners was very low in comparison to the Doctors, Nurses but it is slightly higher than the result of the study by Batra et al. where it was nil.^[20] The lower vaccination among the Cleaners and Ward staff is a matter of concern. It was found that among the sex 27.6% of male was vaccinated and 26.03% of female were vaccinated which was almost the same.

WHO has recommended that there should be proper documentation of the HBV vaccination record and if it is not available with the person, he should be given the

three-vaccine series. CDC is of the view that there is no harm in receiving the extra doses of the vaccine.^[21] We have found that none of the HCWs who had participated had any proper documents to authenticate that they had actually taken the three-vaccine series as declared by them. CDC says that vaccination information should be entered into the hospital information system, if available. HCWs 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.^[22] This type of record will help in verifying the authenticity of the vaccination status and also keep track of unvaccinated HCWs.

The overall protective titre amongst all categories of HCW was 95.76% in our study with Anti HBs titre above 10 mIU/ml. (Figure 1 & Table 2)

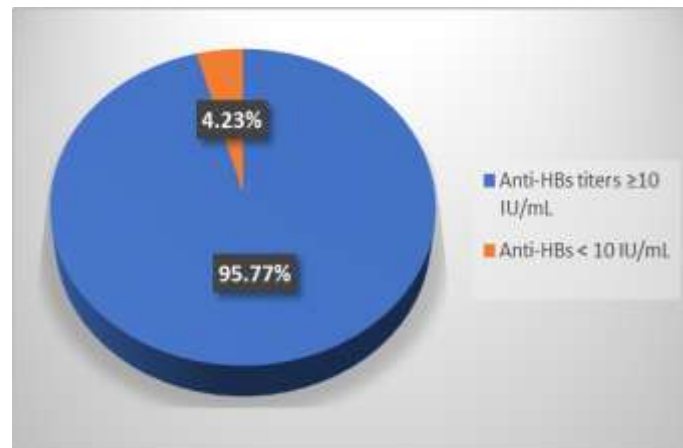


Figure 1: Anti-HBs titre-wise distribution of the vaccinated HCWs.

Table 2: Comparison of Anti-HBs Titre among the Vaccinated HCWs.

Work Category	Anti HBs Titer ≥ 10 IU/ml	Anti HBs Titer < 10mIU/ml	Total	p-value
Doctor	98 (97.02 %)	03 (2.9%)	101	0.474
Nurse	82 (96.47 %)	03 (3.52%)	85	
Lab.Technicians	44 (95.65%)	02 (3.9 %)	46	
Ward & Grade IV	15 (88.23%)	02 (11.76%)	17	
Cleaners	10 (90.90 %)	01(09.90%)	11	
Total	249 (95.77%)	11 (4.23%)	260	

This is comparable to a study finding done by Thomas et al.^[23] who found that 92.5% of the HCWs were sero-protected and 13.7% were below the anti-HBs titre of 10mIU/ml. Our study results in respect to Anti HBs titre is compatible with Varshochi et al.^[24] and Basireddy et al.^[25] who got 98.54% and 96.5% protective immunity respectively. A similar type of study in a tertiary care Hospital in Prevalence of hepatitis B virus infection among healthcare workers in a tertiary hospital in Tanzania was done by A. Muelle et al.^[26] Only 77.1 % of HCWs who received a full vaccination course had an anti-HBs titre >10 IU/ml.

In a study in Italy by Garzillo EM et al.^[27] in HCWs of two tertiary care hospitals 20% had anti-HBsAg titre lower than 10IU / ml. The vaccination status was 80% and female nurses were more protected than male workers with a significant p-value. The vaccination status was better than in the present study. In our study, we have found that vaccination done by different age groups has no association. In this study, we have made one analysis of age group with Anti HBs Titre where we

found out that there was a significant association between anti-HBs titre of the Vaccinated HCWs with age. So Anti HBs according to our study decreased with age.

With the increase in the time since vaccination, there was a significant finding that the seroprotection conferred by the Vaccine gradually decreased.

The assessment of awareness was done by the conduct of a KAP (Knowledge, attitude and practice) study of the Health Care Workers. Various closed-ended questions were asked. It was found in our study that the knowledge score of the different categories of HCWs had different scores. About 27.27% of Cleaners and 35.29% of Ward staff had not heard about Hepatitis B. whereas in contrast almost all Doctors and Nurses have heard about Hepatitis B. So, there is a significant difference between the categories. Better knowledge leads to better precautions for the disease. Similarly, all the questions based on knowledge showed that there is a significant difference. (Table 3)

Table 3: The knowledge of Vaccinated HCWs regarding the spread and prevention of hepatitis B infection.

Questions	Doctors (%)	Nurses (%)	Lab tech (%)	Ward & Grade IV (%)	Cleaners (%)	Total (%)	p-value
Heard of HBV ?	97(96.03)	77(90.58)	37(80.43)	6(35.29)	3(27.27)	220(84.62)	<0.001
Spreads by Needle stick ?	97(96.03)	76(89.41)	36(78.26)	7(41.17)	3(27.27)	219(84.23)	<0.001
Mother to child ?	96(95.04)	74(87.05)	32(69.56)	4(23.52)	1(9.09)	207(79.62)	<0.001
Spreads easily than HIV ?	95(94.05)	70(82.35)	25(54.34)	3(17.64)	1(9.09)	194(74.62)	<0.001
Can it cause liver	96(95.04)	72(84.7)	22(47.82)	3(17.64)	2(18.18)	195(75.0)	<0.001

disease ?							
Can Newborn be vaccinated ?	97(96.03)	79(92.9)	20(43.47)	2(11.76)	1(9.09)	199(76.54)	<0.001
Complete dose known ?	94(93.06)	68(80.0)	15(32.6)	1(5.88)	1(5.88)	179(68.85)	<0.001
HBV can cause liver cancer ?	92(91.08)	65(76.47)	18(39.13)	5(29.41)	2(18.18)	182(70.0)	<0.001
HBV spreads by air ?	96(95.04)	64(75.29)	17(36.95)	4(23.52)	2(18.18)	183(70.38)	<0.001
HBV can spread by breast milk?	93(92.07)	59(69.41)	13(28.26)	2(11.76)	1(9.09)	168(64.62)	<0.001
Is it a curable disease ?	92(91.08)	56(65.88)	15(32.60)	3(17.64)	2(18.18)	168(64.62)	<0.001
Total knowledge score (Mean)	10.70	10.48	9.17	6.88	5.63	8.57	0.0025

The Attitude of the Health Care workers was observed and it was also showing a significant difference. (Table 4)

Table 4: The attitude of Vaccinated HCWs toward hepatitis B vaccination.

Questions	Doctors (%)	Nurses (%)	Lab tech (%)	Ward & Grade IV (%)	Cleaners (%)	Total (%)	p-value
I am not at Risk	1(0.99)	2(2.35)	2 (4.34)	2 (11.76)	2(18.18)	9(3.46)	0.01
I don't need to wear gloves	2(1.98)	3 (3.52)	3 (6.52)	2(11.76)	2(18.18)	12(4.61)	0.06
Used needles proper discard important	101(100)	83(97.6)	44(95.65)	15(88.23)	9(81.81)	252(96.92)	0.01
Vaccination can prevent transmission	101(100)	82(96.47)	43(93.47)	15(88.23)	9(81.81)	250(96.15)	0.026

For preventive practice, the p-values were a significant difference in 3 questions among the categories which implied that in the ward staff and cleaner categories the preventive measures adopted were not satisfactory. (Table: 5)

Table 5: Preventive practices of vaccinated HCWs toward Hepatitis B.

Questions	Doctors (%)	Nurses (%)	Lab tech (%)	Ward & Grade IV (%)	Cleaners (%)	Total (%)	p-value
Do you always sterilize instruments	98(97.03)	70(82.35)	40(86.96)	7(41.18)	4(36.36)	219(84.23)	<0.001
Do you use gloves	97(96.04)	75(88.24)	38(82.61)	6(35.29)	3(27.27)	219(84.23)	<0.001
History of Needle stick injury (NSI)	5(4.95)	10(11.76)	6(13.04)	2(11.76)	1(9.1)	24(92.30)	0.43
Do you wash hands Properly wound after Needle stick injury (NSI)	99(98.02)	70(82.35)	40(86.96)	15(88.24)	9(81.81)	233(89.61)	0.008
Total healthy practice score (mean)	3.76	3.30	3.26	2.30	2.10	2.94	0.003

In our present study, we found out that there is a correlation between knowledge score with Preventive practice score. (Table 6 and Figure 2)

Table 6: Correlation between knowledge score and healthy practice score.

Scores	Mean	SD	N	Correlation coefficient (r)	p-value
Total knowledge score	8.57	2.24	260	0.971	0.006
Total practice score	2.94	0.71	260		

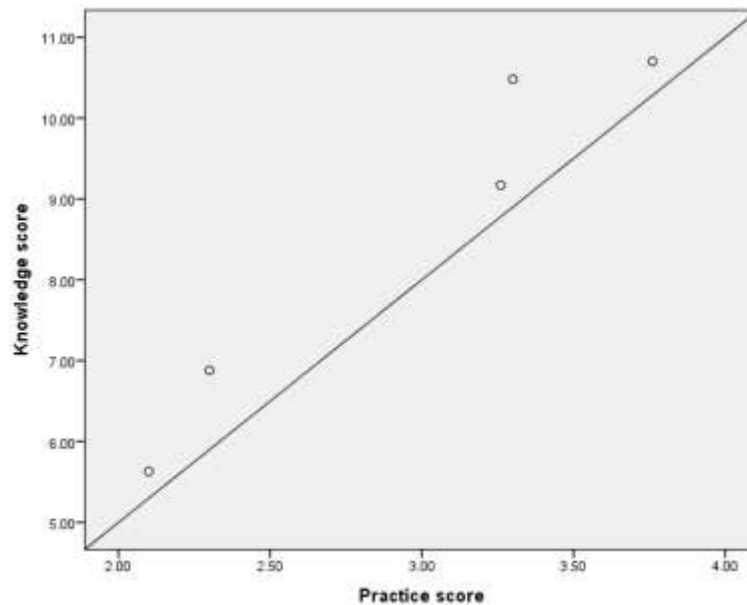


Fig. 12: Scatter plot between knowledge score and practice score.

In a study done in Bangladesh by Islam MN *et al.*^[28] in 2021, they found that knowledge level was 81.07 % and practice level was 72.2% which they had done on student nurses. In our study, we had five categories and they differed according to the category. We have found that it was 97% amongst Doctors, and 95% amongst nurses which was good but only 61.81% and 50.9% in Ward staff, Cleaners respectively. Similarly with reference to the practice score while it was good in Doctors, Nurses & Lab technicians with 94%, 82.5% & 81.5% respectively in our study. But the practice scores in the Ward boys and Cleaner categories were only 57.5% & 52.5% respectively. (Table 6) In a study done by Demiss W *et al.*^[29] in Ethiopia they found that the mean knowledge level was 80.1% Another study done in a Medical College in Tripura by ReangT *et al.*^[30] in 2015 observed that the observed that overall mean knowledge score was 16.2 (SD±3.209) and was found to be significant ($p=0.000$).

In our study, we have found that 4.95% Doctors, 11.76% nurses, 6% Lab technicians, 9.1% Ward staff and 9.1% of cleaners had Needle stick injury. The findings highlight that there is still much-needed action plans to increase the knowledge and attitude of the ward staff and Cleaner category which they are lagging behind in comparison to the Doctors, Nurses, and Technicians. There is a need to increase awareness amongst the HCWs, particularly of Lower education status as it will improve the Preventive measures.

CONCLUSION

The healthcare workers engaged in Tertiary care hospitals are at risk while performing their job. It is therefore very important for healthcare workers to get vaccinated. We found in our study that a very high percentage of the health care workers were still not fully vaccinated although they are working in a Tertiary care

hospital despite having to work in procedures or works with high chances of infections like needle stick injury and other types of exposure. In this study, almost half of the population was vaccinated but interestingly still their knowledge, attitude, and preventive practice awareness was low in the groups like ward staff, Cleaners. Although Hepatitis B vaccines confer long-term immunity still it is seen that the anti-HBs titre is waning gradually and, in some cases, it has reached below the sero-protective level. The HCW may not be aware of the decreased protection activity which the vaccine was providing. It is also important to know the immune status at a required interval. There should be some surveillance activity for the HCWs to know about their Vaccination and also Anti Hbs titre. Those HCWs with decreased protection should be advised for a booster dose. Vaccination should also be complete for the HCWs to reduce the chances of getting HBV infection while at work. Awareness and Knowledge regarding HBV infection can be increased by attending training programs, seminars, group discussions, etc. Strict preventive measures should be followed by the HCWs for effective protection against HBV infection and transmission.

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