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Evaluation of *anti-HBs antibody titers* in the Health-Care Workers(HCWs) of a Tertiary care Hospital, Piparia, Gujarat.

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Abstract

Introduction: In India only 18% of Health care workers (HCW) are vaccinated against Hepatitis B (HBV), despite of the fact that they are at the higher risk of developing infection as an occupational exposure. Present Study is intended to create awareness and screen serum AntiHBs titers among HCWs.

Method: 90 HCWs were included in the study. The categories included residents (n=31), Doctors (n=23), Nursing staff (n=31) and Lab technicians (n=5). Informed consent were obtained and a standard questionnaire was filled regarding the details of their demographic, clinical and immunization status in a preformatted validated detailed proforma. 3 ml of Blood sample was collected aseptically and serum samples were tested by ELISA for AntiHBs titers. Titers lower than 10 mIU/ML were considered negative for anti-HBs. And higher than 10 mIU/ML were considered positive for anti-HBs

Results: Out the 90 HCWs, 73 (81.1%) were completely vaccinated, and 17 (18.9%) were partially vaccinated. Among various groups of HCWs, the complete vaccination rate was highest among the Nursing staff (90.32%) followed by Lab technicians (80%), Doctors (78.26%) and Residents (74.19%). Occupation-wise comparison of anti-HBs titre in completely vaccinated health care workers revealed that 10.71% of nursing staff members and 5.34% of residents were hypo-responsive (<10 mIU/ml), 100% of doctors and 100% of lab technicians were in the protective range with titre ≥ 10 mIU/ml. While comparing the anti-HBs titre among the partially vaccinated HCWs, it has been seen that out of 17 (18.88%) HCWs, majority of the nursing staff members (66.66%) were having titre below 10 mIU/ml followed by Residents (25%).

Conclusion: The study strongly suggests regular screening for anti HBs of all the health care workers should be a mandatory protocol in all the hospitals in India, along with that regular awareness programs regarding the importance of HBV vaccination, outcome of HBV infection, prevention, handling needle stick injuries etc should be promoted and incorporated as a part of infection control strategies in India.

Keywords: Healthcare workers, Hepatitis B virus, Anti HBs titres, Screening

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. ⁽¹⁾ 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. ⁽²⁾ There has been significant decline in morbidity and mortality due to HBV after the availability of HBV vaccine since 1982. ⁽³⁾ Since 1997 CDC has recommended HBV vaccination in all HCWs. ⁽⁴⁾ According to World Health Organization (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. ⁽⁵⁾ 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. Individual with Anti HBs titre after vaccination of < 10 mIU/ml are considered as non-responders, 10 -100 mIU/ml as hypo-responder and > 100 mIU/ml are considered as responders who are fully immune against HBV infection. ⁽⁶⁾ In developing countries including India only 18 % HCWs are vaccinated against HBV. Despite all the recommendations, compliance to vaccination remain meagre in majority of health care settings. ⁽⁷⁾ It is a requisite to determine the titer of Anti-HBs antibodies among the health-care workers to assess and achieve

immunization against HBV due to needle stick injuries, which is widely predominant among the health care settings. Hence, the present study was intended to assess the levels of Anti-HBs antibodies and create awareness among the Doctors and nursing staff members of Dhiraj Hospital, Piparia.

MATERIALS AND METHODS:

- **Type of study:** Prospective, Cross-sectional.
- **Period of study and place:** The study will be conducted for the period of 3 months from September 2021 - November 2021 at Microbiology laboratory, Dhiraj Hospital, Piparia, Gujarat.
- **Study population:** The Health care workers including the Doctors, Nursing staff, Laboratory technician and residents working in various wards, OT and ICU of Dhiraj Hospital like Surgery, Pediatrics, Obstetrics and Gynecology, Medicine, neurology, Anesthesia, ENT, OT, NICU, PICU, ICCU etc. were enrolled in the study.
- **Sample size:** 90 health care workers.
- **Inclusion criteria:** Doctors, Nursing staff, Laboratory technicians and Resident doctors of Dhiraj hospital, who had received either 3 doses of Hepatitis B vaccination or those who are partially vaccinated and have completed at least 6 months of post vaccination period, were included in the study.
- **Exclusion criteria:**
 1. Nursing staff members who are vaccinated in the last 6 months
 2. Those who are not willing to give consent
 3. Those who have recently checked the titer
 4. Those HCW positive for HBsAg or having a history of HBV infection
 5. Those who are not vaccinated.

Methodology: 90 HCWs were included in the study. Informed consent was obtained from them and the objectives of the study will be explained to them. A standard questionnaire was filled regarding the details of their demographic, clinical and immunization status in a preformatted validated detailed proforma.

The participants were then divided into 2 groups based on HBV vaccination status.

Group 1: subjects who had received three doses of HBV vaccination at 0, one, and six months

Group 2: Partially vaccinated group, who has received either single or two doses

Microbiological Investigations: 3 ml blood was collected aseptically from each HCW who participated in the study. Serum was separated and stored in the refrigerator until use. Anti-HBs Antibody test was performed using ELISA. (Kit was procured from DIA.PRO Diagnostic Bioprobes Srl Via G. Carducci n° 27 20099 Sesto San Giovanni (Milano) - Italy). The procedure of ELISA will be performed according to the manufacturer's instructions. Samples with a concentration lower than 10 mIU /ML were considered negative for anti-HBs. Samples with a concentration higher than 10 mIU /ML were considered positive for anti-HBs

Results:

Out of 90 participants, 45.55% were males and 54.45% were females. The mean age of the vaccinated study group was 30.34 ± 5.99 . HCWs were grouped into four categories according to the nature of work they performed at the medical college. The categories included residents (n=31), Doctors(n=23), Nursing staff (n=31) and Lab technicians (n=5). Of the 90 HCWs included, 73 (81.1%) were completely vaccinated, and 17 (18.9%) were partially vaccinated. Out of 72 fully vaccinated individuals, female predominance was observed; 62.5% (45) were

females and 37.5% (27) were males. Among various groups of HCWs, the complete vaccination rate was highest among the Nursing staff (90.32%) followed by Lab technicians (80%), Doctors (78.26%) and Residents (74.19%) (Table 1). It was evident that more nursing staff members were completely vaccinated as compared to the doctors and residents.

Table 1: Baseline data of the Health care workers, N=90

Sr No	Category	Total (%)	Fully vaccinated (%)	Partially vaccinated (%)
1	Total Participants	90	73(81.1)	17(18.9)
2	Gender			
	Male	41(45.6)	27 (65.8)	14(34.2)
	Female	49(54.4)	46 (91.8)	03(6.2)
3	Age-Group			
	≤25 yrs	24(26.7)	22(91.7)	2(8.3)
	26-35 yrs.	48(53.3)	37(77)	11(23)
	≥35 yrs	18(20)	14(77.8)	4(22.2)
4	Health Care Workers (HCW)			
a.	Doctors	23(25.6)	18(78.2)	05(21.8)
b.	Nursing staff	31(34.4)	28(90.3)	03(9.7)
c.	Laboratory technicians	05(5.6)	04(80)	1(20)
d.	Residents	31(34.4)	23(74)	08(26)

Occupation-wise comparison of anti-HBs titre in completely vaccinated health care workers revealed that 10.71% of nursing staff members and 5.34% of residents were hypo-responsive (<10 mIU/ml), which means that they were still at risk of acquiring infection. 100% of doctors and 100% of lab technicians were in the protective range with titre ≥10 mIU/ml.

While comparing the anti-HBs titre among the partially vaccinated HCWs,(Table 3) it has been seen that out of 17 (18.88%) HCWs, majority of the nursing staff members (66.66%) were having titre below 10 mIU/ml followed by Residents (25%). There was no significant association between anti-HBs titre of the participants with their occupation and age. (Table 4).

Table 2. Comparison of Anti-HBs titers among the Completely Vaccinated HCWS

Sr No	Health care Worker	Total No.	Anti HBs Titre ≥10mIU/ml	Anti HBs Titre ≤10mIU/ml
1	Doctors	18(78.2)	18(100)	0
2	Nursing staff	28(90.3)	25(89.28)	3(10.71)
3	Laboratory technicians	04(80)	4(100)	0
4	Residents	23(74)	22(95.65)	1(4.34)
	TOTAL	73	69 (93.15)	4(5.47)

Table 3 Comparison of Anti-HBs Titre among the Partially vaccinated HCWS

Sr No	Health care Worker	Total No.	Anti HBs Titre ≥10mIU/ml	Anti HBs Titre ≤10mIU/ml
1	Doctors	05(21.8)	05(100)	0
2	Nursing staff	03(9.7)	1(33.33)	2(66.66)
3	Laboratory technicians	1(20)	1(100)	0
4	Residents	08(26)	6(75)	2(25)

	TOTAL	17	13(76.5)	04(23.5)
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Table 4: Relationship between Age group and the Vaccination titers

NO.	AGE	Anti HBs Titre ≥10mIU/ml	Anti HBs Titre ≤10mIU/ml	TOTAL
1.	≤ 25	20(83.33)	4(16.66)	24
2.	26-35	44(91.33)	4(8.33)	48
3.	>35	18(100)	0	18
	TOTAL	82(91.11)	8(8.88)	90

Discussion: Hepatitis B virus (HBV) is highly infectious and causes serious health problems worldwide. Approximately one third of the world population has been infected, and 400 million have become chronic carriers. HCWs are at high risk for HBV infection because of exposure of mucus membranes and breached skin to blood. ^(8, 9) According to WHO, 5.9% of HCWs are each year exposed to blood-borne HBV infections corresponding to about 66,000 HBV infections in HCWs worldwide. Reports from India indicate that only 16-60% of HCWs have received complete HBV immunization. ^(10, 11) Paramedics have a higher risk of HBV/HCV transmission and receive HBV vaccination less often than doctors. ^(10, 11) Unfortunately, the practice of vaccination is not well-accepted. In the present study, of 90 HCWs, 73 (81.1%) were completely vaccinated, and 17 (18.9%) were partially vaccinated, while the studies from medical college of Rajasthan between 464 HCWs, 230 (49.6%) were fully and 20 (4.3%) partially vaccinated. A similar study done at New Delhi showed that 55.4% of HCWs were fully vaccinated against HBV ⁽¹¹⁾ A slightly lower incidence of fully vaccinated HCWs, 42.2%, was observed by Kumar *et al* ⁽¹²⁾ This clearly displays that awareness of importance of HBV vaccination in HCWs is better in Gujarat compare to other states in India. The vaccination coverage among the doctors was 78.2%, 90% in nursing staff, 80% in laboratory technician and 74 % in the resident doctors, our vaccination coverage rates were better than the study done in Rajasthan ⁽⁸⁾, vaccination coverage among the doctors was 92.4%, 41.7% in nursing staff and 24.2% in laboratory technicians. This undoubtedly represents that awareness of HBV vaccination, Outcome of HBV infection, Knowledge attitude and perception for handling needle stick injuries etc might be there in doctors but that regular awareness and importance of screening should be advocated to other Health care staff like nurses and laboratory technicians who are continuously flooded with injurious environment. Amongst Doctors who were completely vaccinated, they all had protective titres of ≥10mIU/ml, while among the nursing staff, 89% staff had protective titres while 10% staff showed the titre ≤10mIU/ml, similarly in Residents also 95.6% had had protective titres of ≥10mIU/ml, and 5.4% had low titres. This showed that 15% of the vaccinated HCWs were still at risk of acquiring HBV infection. Among doctors who were partially vaccinated, they all showed a protective titre of ≥10mIU/ml, while in Nursing staff only 33.3% and resident, 75% showed protective titres. It acclaims that 66.6% of nursing staff and 25% residents are prone to HBV infections. It proves the fact that there is a decline in the anti-HBs titer (post booster dose) over a period of one year, importantly the

anti HBs titers were lowered in those who had received vaccination 5 years ago. Long-term studies in hyper-endemic areas indicate that immunological memory remains intact beyond 10 years after vaccination; thus, initial vaccination offers protection against HBV infection even after anti-HBs declines below detectable levels^(13, 14). In fact, there is no evidence to show that healthy vaccinated individuals lose their immunity against HBV infection after anti-HBs titers decline to below 10 IU/mL. As HCWs are likely to contact with virally infected body fluids or blood, particularly those residing in countries of high and intermediate endemicity for HBV, they should receive vaccination at their initial entry to their respective training or professional practice. A booster dose should be recommended if anti-HBs titers are low.

Conclusion: We all know that Hepatitis B is a Vaccine preventable disease, but still there is a big lacuna regarding the awareness of vaccination, significance of evaluating titres over a period, Screening HBsAg, Booster doses with low titres etc in health care workers or sometimes they consider this for granted. The study strongly suggests regular screening for anti HBs should be mandatory for all the health care workers as there is a gradual decline in the anti-HBs titer over the period of time in the vaccinated persons, so partially vaccinated individuals as well as a significant percentage of the fully vaccinated HCWs might have titers insufficient to protect them against HBV infection.

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