

# Serologic Hepatitis B Immunity in Vaccinated Health Care Workers

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**Abstract:** The risk of acquiring hepatitis B infection through exposure for blood or its product is highest among health care workers. The most important approach for the prevention of occupational HBV infection is the use of hepatitis B vaccine among HCWs at risk. The present study was undertaken to assess the immune status of HBV vaccinated health care workers. A total of 268 HCWs of Adichunchanagiri Hospital and Research Centre attached to AIMS, B.G.Nagara were enrolled for the study. The study group includes doctors (113), medical & nursing students (61), nurses (59), technicians (15), group D workers (12) and others (8). The serum samples of the participants were tested for Anti-HBsAb levels using ELISA kit (Diasorin, Italy). Anti HBsAb titre of  $\geq 10$  mIU/ml was considered as immune and  $< 10$  mIU/ml as non-immune. The mean age of the study group was 29.49 years. Of the 268 participants 54.85% were female and 45.14% male. 23.5% had history of complete vaccination and 76.49% had incomplete vaccination (1/2 doses). 72.01% were immune and 27.98% non immune. There is a need for stringent and clear policies for HBV screening, vaccination and post vaccination assessment.

**Keywords:** Health Care Workers, HBV Vaccine, Anti HBsAb

## 1. Introduction

Health care workers (HCWs) have high risk of occupational exposure to many blood-borne diseases including HIV, hepatitis B and hepatitis C viral infections. Of these, hepatitis B is not only the most transmissible infection, but the only one that is preventable by vaccination.<sup>(1)</sup> The most important approach for the prevention of occupational HBV infection is the use of hepatitis B vaccine among HCWs at risk. In developing countries like India, there is no policy of hepatitis B vaccination coverage for HCWs to prevent the HBV infection. Anti HBs antibody is the only detectable serological marker in those who successfully respond to hepatitis B immunization.<sup>(1)</sup>

Hepatitis B vaccine, developed for the prevention of hepatitis-B virus infection, is a non infectious recombinant DNA vaccine produced from genetically engineered yeast *Saccharomyces cerevisiae*.<sup>(2)</sup> Although, there has been modification in the production of the vaccine after its initial development in 1981, the complete vaccination still remains the recommended three-dose regimen, with the second and

third doses being given at 1 and 6 months after the initial dose.<sup>(3)</sup> There is no standardized post vaccination protocol to confirm, monitor and maintain immunity.<sup>(4)</sup> In the present study, an effort is made to study immune status of hepatitis B virus vaccinated HCWs.

## 2. Materials and Methods

The present study was conducted in the Department of Microbiology, AIMS, B.G.Nagara, Karnataka. The study period was from June 2013 to April 2014. A total of 268 HCWs of Adichunchanagiri Hospital and Research centre who volunteered were enrolled for the study. Informed consent was obtained from the study group. Inclusion criteria was vaccinated persons and exclusion criteria was non vaccinated persons. Doctors (113), medical and nursing students (62), nurses (59), technicians (15), group D workers (12) and others (07) formed the study group. Age, gender, occupation and details of vaccination schedule of each individual (dose and duration) were taken.

Blood samples were collected, serum separated and stored at

-20°C until further testing. Anti HBs levels were determined using commercially available ELISA kit (Diasorin, ETI-AB-AUK-3, Diasorin, S.P.A, Italy) as per the instruction manual. Data were analysed categorically for age, gender, occupation, the time elapsed since the last dose of the vaccination and antibody titre were made. Anti HBs Ab titers of  $\geq 10$  mIU/ml were considered as immune and  $< 10$  mIU /ml as non-immune. Ethical committee clearance for the study was obtained from the institution.

### 3. Results

The age of the study group ranged from 19 to 62 yrs with mean age of 29.49years. Of the 268 participants 147 (54.85%) were female and 121 (45.14%) male. 63 (23.5%) had history of complete vaccination and 205(76.49%) were incompletely vaccinated (1 / 2 doses).

**Table 1.** Age, sex and occupation of Hepatitis B vaccinated health care providers and students.

Age years	Doctors (113)		Nurses (59)		Students (61)		Technician (15)		Group D workers (12)		Others (8)		Total (268)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
<20	00	00	00	03	13	10	00	00	00	00	01	00	14	13
21-29	27	33	09	28	11	27	05	01	01	02	01	01	54	92
30-39	19	14	02	13	00	00	04	00	00	02	01	01	26	30
40-49	07	02	00	03	00	00	04	00	02	04	01	01	14	10
>50	10	01	00	01	00	00	01	00	01	00	01	00	13	02
Total	63	50	11	48	24	37	14	01	04	08	05	03	121	147

**Table 2.** Immune status of health care workers in relation to gender.

Gender	Immune		Non-immune	
	No	%	No	%
Male No-121	79	65.28	42	34.71
Female No-147	114	77.55	33	22.45

**Table 3.** Occupation wise immune status of health care workers and students

Occupation	Immune		Non Immune	
	No	%	No	%
Doctors (113)	79	69.91	34	30.08
Nurses (59)	49	83.05	10	16.94
Students (61)	43	70.49	18	29.50
Technicians (15)	09	60	06	40
Group D workers(12)	09	75	03	25
Others (8)	04	50	04	50
Total	193	72.01	75	27.98

**Table 4.** History of vaccination among health care providers and students.

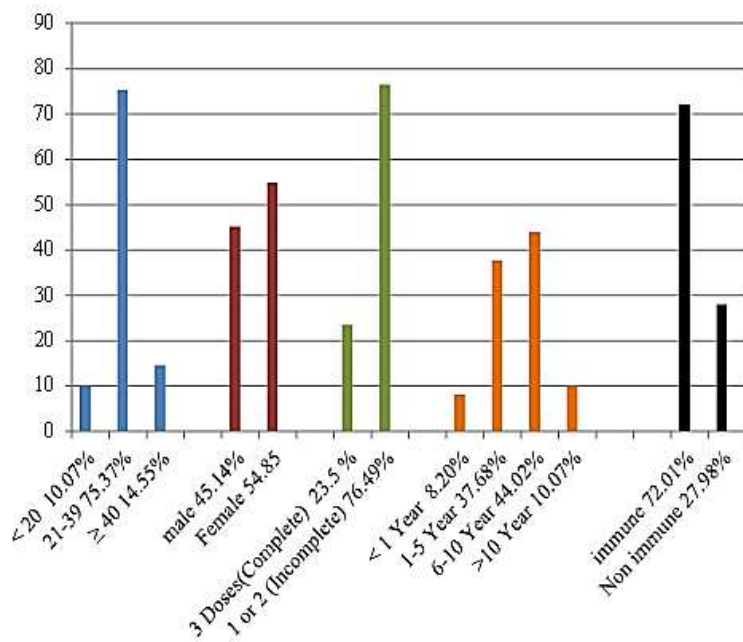
History	1 dose	2 doses	3 doses	Total
<1 year	05	14	03	22
1-5 years	01	85	15	101
6-10 years	03	82	33	118
>10 years	00	15	12	27
Total	09	196	63	268

**Table 5.** Immune status of health care workers in relation to occupation and immunization history.

Occupation	Complete immunization	Immune	Nonimmune	Incomplete immunization	Immune	Non Immune
Doctor (113)	41	32 (78.04%)	9 (21.95%)	72	47 (65.27%)	25 (34.72%)
Students (61)	10	8 (80%)	02 (20%)	51	35 (68.62%)	16 (31.3%)
Nurse (59)	05	05 (100%)	00	54	44 (81.48%)	10 (18.51%)
Technicians (15)	03	01 (33.33%)	02 (66.66%)	12	08 (66.66%)	04 (33.33%)
Attenders (12)	00	00	00	12	09 (75%)	03 (25%)
Others (8)	04	02 (50%)	02 (50%)	04	02 (50%)	02 (50%)
268	63 (23.05%)	48 (76.19%)	15 (23.8%)	205 (76.49%)	145 (70.73%)	60 (29.26%)

**Table 6.** Immune status of health care workers in relation to duration of vaccination.

Duration of immunization	Immune	%	Non Immune	%
< 1 Year No- 22	19	86.36%	3	13.64%
1-5 Years No-103	99	96.11%	4	3.88%
6-10 Years No-115	63	54.78%	52	45.21%
>10Years No-28	12	42.85%	16	57.14%
Total-268	193	72.01%	75	27.98%



**Fig 1.** Age, sex, occupation, vaccination doses, duration and immune status of study group

### 4. Discussion

Hepatitis B virus infection is a serious global health problem with 2 billion people infected world wide and 350 million suffering from chronic HBV infection. The 10<sup>th</sup> leading cause of death worldwide.<sup>(5)</sup> India is second to China in the numbers of chronic HBV infection. In India, HBsAg

prevalence among general population ranges from 2-8%, which places India in intermediate HBV endemicity zone. Among HCWs, seroprevalance is 2-4 times larger than that of general population.<sup>(1)</sup> Previous study from this institution showed 1.19% sero-prevalence of HBV infection among HCW.<sup>(6)</sup>

In the present study, out of 268 HCWs studied, 193 (72.01%) were immune which is more than the report of

Arun Kumar (67.34%) and less than Chathuranga (90.1%).<sup>(7,8)</sup>

In the present study, 63 (23.05%) were completely vaccinated (3 doses), among them 48 (76.19%) were immune which is similar to the study of Singh (82.2%), Arun Kumar (73.5%), Craig (71%) and Njemanze (95.1%).<sup>(9,7,4,10)</sup> According to Craig, 10% of the patients who receive and respond to vaccination lose anti-HBs after 5 years and 50% lose anti-HBs after 10 years.<sup>(4)</sup> In this study 12(19%) were vaccinated more than 10 years back, this may be the reason for low immune status among the completely vaccinated persons.

Among 205 (76.49%) incomplete vaccinated persons 145 (70.73%) were immune & 60 (29.26%) were non immune, whereas Arun Kumar reported 53.3% as immune.<sup>(7)</sup> Out of 205 (76.49%) incompletely vaccinated persons 19 (9.2%) were recently (<1yr) vaccinated & 86 (41.95%) were vaccinated within 5 years. Hence the percentage of immunity among incomplete vaccinated person is high.

Out of 9 (3.35%) persons who had taken single dose, 4 were immune (44.44%) and 196 persons with 2 doses, 140 (71.42%) were immune. Protection following the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> dose of recombinant vaccines has been reported to be 20-30%, 75-80%, 90-95% respectively.<sup>(1)</sup>

Gender based information in the present study revealed higher immunity in females 114 (77.55%) compared to males 79 (65.28%), similar to studies of Ganczak (79.5%), Chathuranga and Shruthi hedge.<sup>(11,8,12)</sup> According to Varsha singhal, 5-10% of the adult population will not respond to standard HBV vaccination.<sup>(13)</sup> Risk factor for vaccine non-response include: male sex, older age, cigarette smoking, obesity, immunodeficiency, chronic diseases, certain HLA halotypes, celiac disease, etc.<sup>(14,15)</sup>

In the present study, the percentage of immune status of nurses is higher (83.05%) compared to others which is consistent with the study of Shin BM (79.6%), the reason could be frequent subclinical exposure.<sup>(16,9)</sup>

Participants were informed about their immune status, those who are immune were advised for a booster dose and non immune subjects were recommended for a complete course of vaccination. Some authors suggest that at least 1 booster dose should be administered 5 to 10 years after the initial series, whereas others believe that because of expected immunologic memory, booster shots are not necessary in persons with a normal immune status.<sup>(4)</sup>

At the time of recruitment in healthcare settings, the employees should be assessed for the presence of HBsAg and anti-HBsAb titres, if they are non-immune, complete course of vaccination should be given.<sup>(7)</sup>

In western countries, before entering into nursing, medical schools and employment in healthcare settings, vaccination or demonstration of immunization against HBV must be recorded for legal and medical reasons and if not immunized, they need to be vaccinated.

In India, 28% health care workers are unvaccinated and 17% are unaware of vaccination.<sup>(17)</sup> In a developing countries like India, despite of availability of HBV vaccine, the vaccination rate among health care providers is

low. The reasons may be lack of motivation, lack of awareness, non availability in health care sectors, high-cost, fear of side effects, fear of being recognized as a HBV carrier, lack of perceived need for the vaccine and erroneous belief of non-susceptibility to the infection.<sup>(18)</sup>

There is a need for well placed and clear policies for HBV screening and vaccination in HCWs especially those who are at greater risk.<sup>(1)</sup>

Post vaccination testing should be done for health care workers, as it is rarely practiced in most of the institutions in India. This test is essential since they may be one among the 5-32% of non-responders who are susceptible to HBV infection.<sup>(4)</sup>

## 5. Conclusion

HBV vaccination coverage is still inadequate in our country among high risk groups. The reason could be due to absence of vaccination policies by the hospital management and lack of awareness among health care workers. To conclude, at the time of recruitment all the HCWs should be screened for the presence of HBs Ag and anti HBs Ab titres. If the person is not vaccinated 3 doses of vaccine should be administered and strict post vaccination testing to document immunity remains the key practice to detect non-responders among medical staff.

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