

## Hepatitis B vaccination status of health care workers and their antiHBs titres - A cross sectional study

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**Abstract:** *Back ground:* The risk from occupational exposure to HBV infection is 2-4 times higher in HCW's. A protective vaccine with a reported efficacy of 95% is available. Yet many HCW's in developing countries remain non vaccinated, incompletely vaccinated or if vaccinated unaware of their post vaccination anti HBs status. Estimation of protective immune response following vaccination is essential to clear the misconceptions regarding booster dose of vaccine and non responder state which prevails among the HCW's. *Objective:* The present study is designed to assess the hepatitis B vaccination rates in HCW's and their antiHBs titres. *Material and methods:* A cross sectional study on 87 subjects was carried out at a tertiary care hospital by testing their sera for HBsAg & anti HBs levels. *Results:* None of the HCW's were found to be HBsAg positive. Vaccination rate observed was 79%. Most vaccinated were the doctors and least the paramedics. Among doctors variation within the occupational groups was noticed. More number of males and young subjects were vaccinated and protected. Only 49% of the vaccinated HCW's were vaccine compliant and 35% of these were protected. Factors like age, sex and time since last dose of vaccine influenced the anti HBs titres. None were aware of their anti HBs titres post vaccination. *Conclusion:* The study group involves only a small number of HCW's but the findings are significant. Keeping in mind the annual global hepatitis B infection rates in HCW's in developing countries we recommend the health care authorities to strengthen the existing educational programmes on Hepatitis B infection which improves the awareness levels and thereby increases the vaccine rates. Further to make essential post vaccination assessment of antiHBs titres and its documentation to clear misconceptions regarding booster dose of vaccine.

**Keywords:** Hepatitis B Virus [HBV]; Hepatitis B vaccine; Anti HBs titres; Health care workers [HCW's].

### Introduction

Hepatitis B is an infection caused by hepatitis B virus transmitted through percutaneous (breach in the skin) and mucosal (direct contact) exposure to infectious blood and body fluids. HBV infection is a well recognized occupational risk globally [1]. The federal standard defines occupational exposure as reasonably anticipated skin, eye, mucous membrane or percutaneous contact with blood and other potentially infectious materials that might result from the performance of an employee's duty [2-3]. The risk of acquiring HBV infection from occupational exposure is dependent on the frequency of percutaneous and mucosal exposures to blood and body fluid (semen saliva and wound exudates) containing HBV, particularly fluids containing HBeAg. Hence the HBeAg status of the source (a marker of HBV replication and viral load) matters [4-9]. The virus is highly infectious ten times more infectious than HCV and hundred times more

than HIV [10]. In non immune persons disease transmission from needle stick injury is up to 100 times more likely from exposure to HBe antigen positive blood than HIV positive blood [11]. The risk is higher during the professional training and varies through the person's career depending upon the task performed [1].

Health care workers in developed countries have the highest burden of HBV infection from exposure to contaminated sharps [12]. WHO has estimated an annual global burden of 66000 cases and 261 deaths due to occupational HBV infection in health care workers [12]. Sharp injuries account for 40-60% of occupational HBV infection in developing countries [3, 12]. India is an intermediate endemic zone for HBV infection with 2-8% seroprevalence in general population and the second largest global

producer of chronic hepatitis B virus infection with 50 million cases. High prevalence rates of the infection in general population increases the risk of occupational exposure in HCW's which is 2-4 times higher than in general population [13]. In order to combat HBV infection in general population, immunization with hepatitis B vaccine plays a major role and is included in the national immunization programme [14-16].

Occupational Health and Safety Administration [OSHA] recommends HBV vaccination followed by confirmation of vaccine response in all HCW's by initial anti HBs assay within one to three months of primary immunization [10]. In developing countries for control of HBV infection in HCW's there is no national policy advocating and supporting mandatory immunization against hepatitis B infection and guidelines for post exposure prophylaxis. Data on HBV vaccination status of HCWs; estimates of vaccine coverage among HCWS is needed to calculate the population susceptible to infection and for effective intervention in the form of vaccination or post exposure prophylaxis [17].

*Aim:* The present study was designed to estimate Hepatitis B vaccination rates and the anti HBs titres of HCWs at a tertiary care hospital.

### Material and Methods

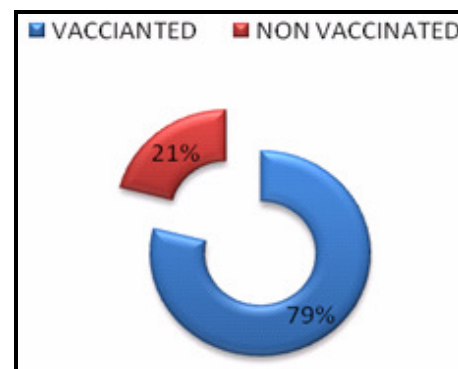
This is a cross sectional study carried out between Jan-Feb 2012 at a tertiary care teaching hospital. About 329 health care workers were requested to participate in the study through a formal letter and a self administered questionnaire consisting of personal details in the form of age sex and designation. Vaccination details like number of doses, year of vaccination, testing for post vaccination antiHBs levels and booster dose was documented. Blood samples in 5ml quantity were collected after informed consent from 87 subjects who agreed to participate in the study. Samples were allowed to clot and serum was aliquoted and frozen at -20c till testing. All the subjects were tested for HBs Ag using HEPATITIS B surface antigen detection card from Transassia GMBH Manheim Germany. And anti HBs levels were checked using a commercially available anti HBs ELISA KIT from S.p.A Diasorin Italy for quantitative estimation of anti HBs titres. The sensitivity and specificity of the kit is 99.0% and 99.8%. The principle of the assay is non

competitive sandwich elisa. Test was performed as per the manufacturer instructions. HCW's were characterized as protected against hepatitis B infection when their Anti HB s titre was  $\geq 10$  IU/L and un protected when the titre was  $< 10$  IU/L.

### Results

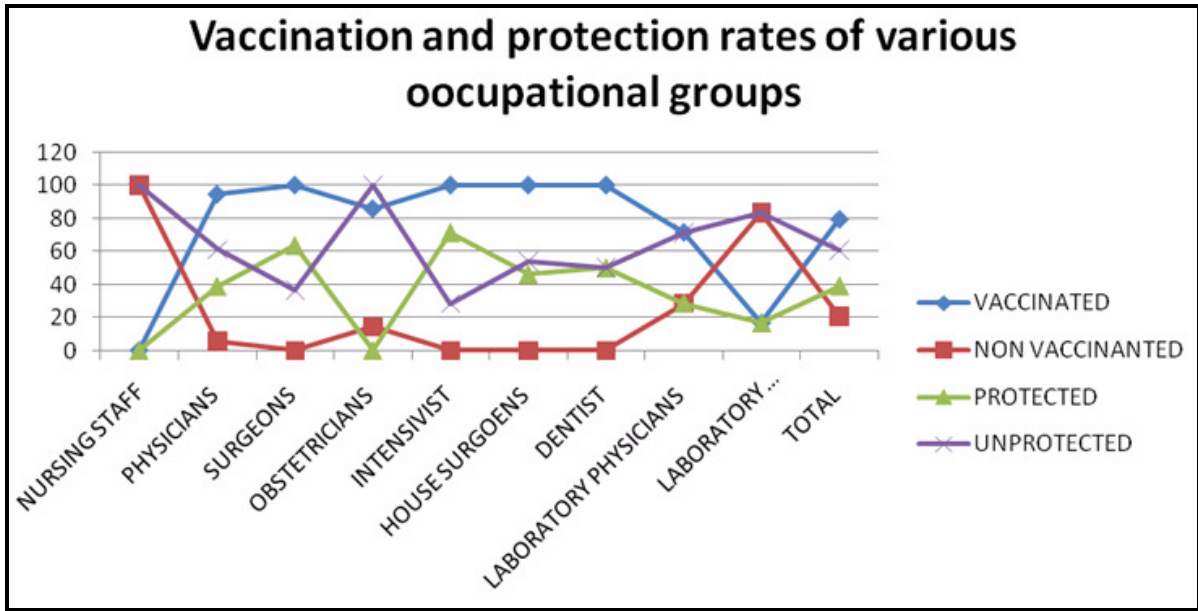
Of the 87 subjects who enrolled in the study 69 were vaccinated and 18 nonvaccinated [fig 1]. Females predominated in the in the unvaccinated group being 11 [61%] and all were paramedics where as only 7 [39%] were males and all were qualified physicians. None of the subjects were found to be HBsAg positive.

**Fig-1: Hepatitis B vaccination status of HCW's**



In the present study we had HCW's from various occupational backgrounds; physicians about 18 [21%], surgeons 11 [13%], obstetricians 7[8%] laboratory physicians 7 [8%], intensivist, 14 [16%] nursing staff, 9[10.3%] dentist 3[3.4%], house surgeons 13 [14.9%], laboratory technicians 5 [5.7%] respectively. They differed in their vaccination and protection rates. Doctors were the most vaccinated and protected 63/73 [86.3%], 31/ 73 [42%] where as the least vaccinated and protected were the paramedics 6/14 [43%], 5/14 [35%]. Further we have observed that among the doctors the most vaccinated and protected were the anaesthetist, surgeons, intensivist working in high risk areas. However some health care givers showed low vaccination rates like the nursing staff; and low titres of anti HBs despite vaccination in obstetricians was observed; though their job involves greater risk of exposure to contaminated blood and body fluids.

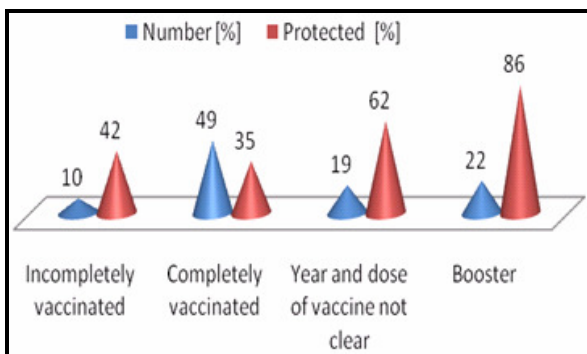
**Fig-2: Vaccination rates and the protected HCW's in various occupational groups**



Of the 69 subjects who received vaccination in some or the other form, 7 were incompletely vaccinated, 13 were not sure of the year and number of doses of vaccine received, 34 were completely vaccinated and 15 even received a booster dose of the vaccine. Their Anti HBs titres showed that 3 /7 of incompletely vaccinated subjects, 8/13 of the subjects who were not sure of the year or number of doses, 12/34 of the vaccine complaint group and 13/15 of the HCW's who received a booster dose of vaccine were having antiHBs titres above > 10IU/L.

similar finding 22 /34 i.e. [65%] were in the age group of 21-40 years.

**Fig-3: Vaccination status and protected HCW's in various groups**



**Table-1: Age wise distribution of vaccine compliant HCW's and their protection rates**

Age	Protected	Unprotected	Total
21-30	6 [50%]	6 [27%]	12 [35%]
31-40	4 [33%]	6 [27%]	10 [29%]
41-50	1[8%]	6 [27%]	7 [21%]
51-60	0[0%]	2 [9%]	2 [17%]
61-70	1 [8%]	2 [9%]	3 [9%]
Total	12 [35%]	22[65%]	34 [100%]

With respect to age more number of the people were found to be vaccinated and protected in the age group 21-40 years Their geometric mean concentration of anti HBs was 61.172 IU/L ±180.603. The vaccine compliant group showed a

In the present study data on gender wise distribution of the HCW's showed that of the 87 subjects 53% were males and 47% were females. The overall vaccination rate was higher in males 85% than in females 73% and the GMC of anti HBs was also high for males i.e 104.771 ±196.763 than in females 65.834 ± 333.132. Further in the vaccine compliant group an equal number of both the sexes were vaccinated and moreover more number of females were protected than males. Any how the overall GMC of antiHBs was higher in males 224.636±176.917 than in female 24.153±78.472.

**Table-2: Gender wise distribution of HCW's and their vaccination and protection rates**

	Gender	
	Male	Female
Total	46	41
Vaccinated	39	30
Non vaccinated	7	11
Protected	23	11
Unprotected	23	30
Vaccine compliant and protected	5	7
Vaccine compliant and unprotected	12	10
Vaccine non compliant and protected	18	4
Vaccine non compliant and unprotected	11	9

Decline in anti HBs titres was evident with time in the vaccine complaint group and their GMC also showed a similar fall. About 55% of the HCW's were showing protective immunity for less than 5 years period ; 33% for less than 10 years and only 12.5% of the HCW's were protected after ten years.

**Table-3: Anti HBs status of the vaccine complaint group of HCW's in relation with time**

Time since vaccination	Protected	Unprotected	Total	GMC IU/L ±SD
< 5 years	6	5	11	77.349 ± 202.127
< 10 years	5	10	15	46.380 ± 179.709
> 10 years	1	7	8	-----

**Discussion**

The present study is based on the data gathered on HBV vaccination status of HCW's by administrating a questionnaire and their present anti HBs levels. Only 87 subjects out of the 329 HCW's agreed to participate in the present study. One of the reasons for low acceptance to participate in the study could be due to apprehension of being detected as Hepatitis B positive and its associated consequences, and loss of protective immunity following vaccination

which places them in the high risk group for contracting infection. Hepatitis B vaccine coverage was 79%, which correlates well with the study done by Luiz et al 79% and Younus et al 71% [18-19]. High vaccine acceptance rate have been mentioned by Mehdi Sabirfiroozi et al 87% and ali et al 86% [20-22]. The proportion of vaccinated HCW's differed in various occupational groups.

Doctors were the most vaccinated 73% and the least vaccinated were the paramedics like nurses, dental assistants and laboratory technicians.14%, these findings are consistent with the study done by other authors like S.hussain et al and younus et al [19,23-27]. Further discrepancy was noticed in doctors with respect to their profession from high risk area to low risk area the most vaccinated were the anaesthetist, surgeons, intensivists 70%, 63% and 50% which has also been reported by [23-27].

Some occupational groups though at a higher risk of occupational exposure and needle stick injuries remained unvaccinated like dentist, laboratory physicians, nursing staff etc for reasons like negligence, ignorance and unaffordability similar findings have been reported in the review article and articles by [17, 28-29]. In the present study vaccine acceptance and protection rates were high in males which reiterate the findings of Mehdi et al [21]. An inverse relation was observed with respect to age, vaccine acceptance and protective titres of antiHBs which is consistent with the findings of resende et al [30]. Of the 79% of vaccinated HCW's 10% were incompletely vaccinated with one or two doses of the vaccine, similar reports have been stated by [13,31-34] and higher rates by [21,23]. Less than fifty percent i.e. 42 % of these incompletely vaccinated people were having protective levels of anti HBs indicating that the first two doses of the vaccine stimulates and prepare the immune system for secondary response whereas the third dose produces the secondary response and acts as a biological booster as reported by [31-32].

However the CDC update MMWR weekly report 2011 says that persons with an incomplete vaccination series are not

considered as protected and should complete the > 3 dose series [1]. 19% of the HCW's were not sure about the year of vaccination or the number of doses received, though a substantial number 62% of this group of subjects were having protective levels of antibody to hepatitis B surface antigen. The status of the rest 38% with less than 10 IU/L of antiHBs titres in this category as protected or unprotected is not sure as none had their post vaccination titres assessed which places them at the risk of contracting infection on accidental exposure.

A small group of 34 subjects 49% were vaccine compliant; who have completed the primary vaccination series of three doses which is consistent with reports of [13, 33-40]. Of this only 12 [35%] were found to be protected which is very low. And the remaining 65% of the vaccine compliant group had titres < 10 IU/ml which could be due to loss of immunity with time or a non responder state which is difficult to decide as again non had got their post vaccination anti HBs titres assessed 1-3 months following last dose of vaccine. The exact duration of immunity after vaccination against HBV is not known It has been reported by some authors that protective immunity last for 10 years or more following vaccination [33, 42-43].

Further it is noted that 10% of the of the subjects who receive and respond to vaccine lose anti HBs after five years and 50 % lose it after 10 years [44-45]. In our study we have observed that with time in vaccine compliant group 45% of the subjects within 5 years, 67% within ten years and 86% after 10 years showed antiHBs titres < 10 IU/L which correlates with the work reported by [21, 33, 41]. Moreover it is stated that the decline in titres is related to the initial antiHBs titres and age at vaccination [42]. However it has been established that the disappearance of antibodies does not imply loss of protection as persistence of immunological memory of peripheral blood

lymphocytes serves the purpose [27, 34]. And as per the CDC recommendations there is no need for booster dose of vaccine in immuno competent HCW's with good initial immune response following vaccination [46-51].

### Conclusion

A god number of HCW's are vaccinated in the present study but only a small proportion of them are vaccine compliant and very few are protected. None of them are aware of their initial antiHBS titres 1-3 months post vaccination. Therefore these findings makes it very clear the significance of initial assessment of antiHBs titres following vaccination which is the deciding factor in establishing the immune status of the host whether protected on unprotected and further line of action in case of true non responder state and in management of post exposure prophylaxis. Further it clears the misconceptions regarding the booster dose of vaccine.

### Recommend

As per CDC definition HCW's fall in the high risk group for contracting hepatitis B infection at any time of their professional career. In order to improve the vaccine acceptance rates HCW's need to have a good orientation of HBV infection and its vaccine with due emphasis on the right dose and schedule of vaccine. This can be only be achieved by ongoing continuing medical educational programmes. Further the essence of assessment of initial antiHBs titres to be stressed and its documentation to be practiced.

### Acknowledgments

We are grateful to the management and administrative staff of the Deccan college of medical sciences and teaching hospital i.e. Princess esra hospital for extending the financial and academic support.

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