



## ANTIBODY TITRE FOLLOWING HEPATITIS B VACCINATION AMONG HEALTHCARE WORKERS IN A TERTIARY CARE CENTRE

### Microbiology

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### ABSTRACT

**Background:**Health care workers (HCWs) are at high risk of acquiring hepatitis B virus infection through occupational exposure which is preventable through Hepatitis B vaccination.

**Aims and Objectives:**To study the response to HBV surface antigen vaccine by testing anti HBs titre among HCWs

**Material & Method:** Blood samples of HCWs who have completed 3 doses of HBsAg vaccine was tested for anti HBs level.

**Result:** Out of total 120 HCWs included in the study ,106 (88.33%) HCWs developed protective immunity (Above 10 mIU/ml) to HBV.68 (56.66%) HCWs showed titre between 10 mIU and 1000 mIU/ml and 38 (31.66%) showed titre above 1000 mIU/ml. 14.8% of males showed unprotective titre (Titre < 10mIU/ml) ,while (9.1%) of females showed unprotective titre(Titre < 10mIU/ml) .Non protective titre (<10mIU ) was found in 10 ( 19%) in the age group of > 35 years, followed by 8.3% below 30 years and 5.4% between 30-35 yrs

**Conclusion :** Determining Anti HBsAg titre of HCWs after completion of 3 doses of Hepatitis B vaccination is essential for assessing the safety of HCWs

### KEYWORDS

Healthcare worker ,Anti HBsAg, Occupational exposure

### INTRODUCTION :

Hepatitis B virus infection is a serious global health problem resulting in 500,000 to 1.2 millions deaths per year caused by chronic hepatitis, cirrhosis and hepatocellular carcinoma<sup>(1)</sup>. Health care workers (HCWs) are more prone to contracting this debilitating disease. They are vulnerable to contaminated sharp injuries which constitute a major source of hepatitis B infection. According to WHO, 5.9% of HCWs each year are exposed to blood-borne HBV infections corresponding to about 66000 HBV infections in HCWs worldwide<sup>(1,2)</sup>

HBV infection can be prevented through HBV surface antigen (HbsAg) vaccination. HCWs should be vaccinated against HBV with a standard vaccination schedule. Three standard doses of recombinant HBV vaccine should be administered intramuscularly in the deltoid region at a 0,1, and 6 month schedule. Testing for the evidence of protective immunity to HBsAg vaccination is essential, as some vaccinees do not develop sufficient levels of antibodies ( anti HBs) against HBsAg. An anti-HBs titre of < 10 mIU/ml is regarded as non responsive to HBsAg vaccination who are more at risk of acquiring the infection with potential progression to fatal sequelae. Various studies have shown the prevalence of non-responsiveness to the initial 3 dose regimen ranging between 10-15 %<sup>(1)</sup>

Anti HBs-levels 10 and 100 mIU/ml are regarded as hypo-responsiveness and level > 100 mIU /ml are taken as a high level of immunity. An anti HBs level of > 10 mIU/ml is generally considered as protective against HBV infection.<sup>(3,4)</sup>

Many health care workers in the 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 cure the misconceptions regarding booster dose of vaccine and non responder state which prevails among HCWs.<sup>(5)</sup>

This study was undertaken to evaluate anti-HBs titre among the HCWs after HBsAg immunization in a tertiary care centre.

### MATERIAL & METHOD:

Study was carried out in a tertiary care hospital for a period of one year. This study was approved by the Institutional ethical committee . Total 120 HCWs who had completed 3 doses of Hepatitis B

vaccination were included in the study. Known HBsAg positive HCWs were excluded from the study. After written consent HCWs were updated regarding the objectives of the study. A standard questionnaire was given. Participants were tested for anti- HBs levels .

**Inclusion criterion:** HCWs including nursing staff, doctors, residents and laboratory technicians working in the hospital who have completed 3 doses of HBV vaccination.

**Exclusion criterion:** HCWs with a history of HBV infection in the past. HCWs who have received hepatitis B immunoglobulin prophylaxis for exposure to HBV

**Methodology:** After written consent HCWs received counselling and explanation on the objectives of the study. Detailed personal history was taken using standard questionnaire including, age, gender, occupation, department, duration of employment, history of chronic diseases, past history of blood transfusion, History of Hepatitis in the past, vaccination doses with date and interval after completion of vaccination.

5 ml blood of HCWs who have completed HBV vaccination was collected with aseptic technique.

HBsAg testing was done by CIMA.

Assessment of anti-HBs titre: Antibody titre was tested by Abbott architect anti-HBs assay on Architect i2000 system.

### RESULT :

Out of total 120 HCWs included in the study 52 (43.33%) were doctors, 37 (30.83%) laboratory technicians and 31 ( 25.83% ) nursing staff.

**Table 1: Anti -HBs titre of HCWs**

| Total | Titre < 10mIU/ml | Titre between 10-1000 mIU/ml | Titre >1000mIU/ml |
|-------|------------------|------------------------------|-------------------|
| 120   | 14 (11.66%)      | 68 (56.66%)                  | 38 (31.66%)       |

Overall 106 (88.33%) of vaccinated HCWs developed protective immunity (Above 10 mIU/ml) to HBV. 68 (56.66%) showed titre between 10 mIU and 1000mIU/ml and 38 (31.66%) showed titre above 1000 mIU/ml. 14 (11.66%) of vaccinated HCWs did not develop protective titre.

**Table 2: Relation between gender and anti- HBs titre**

| Gender | No | HCWs not protected <10mIU/ml | HCWs protected >10mIU/ml |
|--------|----|------------------------------|--------------------------|
| Male   | 54 | 8 (14.8%)                    | 46 (85.2%)               |
| Female | 66 | 6 (9.1%)                     | 60 (90.9%)               |

The study population comprised 66 (55%) females and 54 (45%) males.

14.8% of males showed unprotective titre (Titre < 10mIU/ml) ,while (9.1%) of females showed unprotective titre(Titre < 10mIU/ml)

**Table3: Age of HCWs and anti- HBs titre**

| Age in years | Total HCWs | HCWs not protected <10 mIU/ml | HCWs protected >10mIU/ml |
|--------------|------------|-------------------------------|--------------------------|
| <30 yrs      | 12         | 1 (8.3%)                      | 11 (91.7%)               |
| 30-35 yrs    | 55         | 3 (5.4%)                      | 52 (94.6%)               |
| >35 yrs      | 53         | 10 (19%)                      | 43 (81%)                 |

The age of HCWs ranged from 28 years to 62 years in our study.12 (10%) HCWs were below 30 years,55 (45.83%) HCWs between 30-35 years and 53(44.16%) above 35 years of age.Non protective titre (<10mIU) was found in 10 (19%) in the age group of > 35 years, followed by 8.3% below 30 years and 5.4% between 30-35 yrs

**Table 4: The time elapsed between the last dose of vaccination and the time of assessment of anti-HBs levels**

| Years after vaccination | No of HCWs (%) | HCWs not protected Anti HBsAg antibody titre<10mIU/ml | HCWs protected Anti HBsAg antibody titre>10mIU/ml |
|-------------------------|----------------|---|---|
| < 5 yrs                 | 65             | 5 (7.7%)  | 60 (92.3%)  |
| 6-10 yrs                | 40             | 4(10%)  | 36(90%)   |
| >10yrs                  | 15             | 5(33.33%)   | 10(66.67%)  |
| Total                   | 120            | 14  | 106   |

The time elapsed between the last dose of vaccination and the time of assessment of anti-HBs ranged from 6 months to 20 years. It was evident that immunity against HBV had reduced significantly over the time.

## DISCUSSION:

Hepatitis B infection is a major cause of liver cirrhosis and hepatocellular carcinoma. Vaccination is the effective way of preventing infection and its complications.Anti-HBs is an important serological marker to assess vaccine induced immunity to HBV<sup>(6)</sup> Hence HCWs need to be vaccinated due to the increased risk of occupational exposure. In our study we have analyzed the data of 120 completely vaccinated HCWs.

Majority (88.33%) of HBsAg vaccine compliant subjects were anti HBs positive (Titre > 10mIU/ml) .31.66% of the HCWs showed titre above 1000 mIU/ml (Table 1) .Similar immunogenicity of HBV vaccine has been reported by others<sup>(7,8)</sup> . Out of the total 120 HCWs included in the study 52 (43.33%) were doctors,37 ( 30.83%) laboratory technicians and 31 (25.83%) Nursing staff.

The study population comprised 66 (55%) females and 54 ( 45%) males. ,which is similar to study by Sahana et al and Rao et al<sup>(9,10)</sup> Whereas other studies showed male preponderance<sup>(2)</sup> The percentage of male nonresponders (14.8%) was higher than their female counterparts (9.1%) .(Table 2) .Similar have been reported in previous studies<sup>(11,12)</sup> Smoking and certain genetic factors have been proposed as probable reasons for a poor immune response to HBV immunization in men<sup>(3)</sup>.

Majority (45.83%) of the HCWs were in the age group of 30 to 35 years. Non protective titre (<10mIU) was found in 10 ( 19%) in the age group of > 35 years, followed by 8.3% below 30 years and 5.4% between 30-35 yrs( Table 3) .It has been shown that when the age at vaccination is >40 years the rate of sero conversion to anti-HBs is less. Whereas when the age at vaccination is < 40 years ,seroconversion to anti HBs is higher than the former subset<sup>(11)</sup> ,

There was a significant decline in the antibody titre as the years of vaccination prolonged. In the present study 26.66% of the HCWs after 6-10 years of vaccination and 10% of HCWs between 6-10 years of

vaccination showed titre <10mIU/ml ( Table 4) . Similar observations were made by Sahana et al<sup>(9)</sup> in their study.WhileMahawal et al observed nonresponders in 19.1% 5 years after vaccination and 53.9% after 10 years<sup>(13)</sup> .In our study sero negativity was 7.6% when the duration was ≤5 years.

Pearson correlation indicates negative association of the anti-HBs titres as the time progressed. When time since vaccination was considered,the protection rate declined and there was statistically significant reduction in anti –HBs titre beyond 10 years of post vaccination.Our study is comparable with previous study conducted in Iran by Norouzirad et al,which showed seroprotection rate of 65% at 5 years after vaccination with significant decline over time<sup>(14)</sup>

During this period as part of infection control activity we created vaccination awareness.The HCWs were informed regarding their HBs titre.As a vaccination campaign all HCWs were sensitized towards the necessity for receiving 3 doses of Hepatitis B vaccination and estimation of anti-HBs titres periodically. All categories of HCWs were vaccinated with 1<sup>st</sup> dose during the time of recruitment followed by post vaccination measurement of antibody titre 1 month after the last dose.

## CONCLUSION:

It is recommended that all HCWs should undergo initial anti-HBs assay within one to three months(less than six months) of last dose of primary vaccination<sup>(15,16,17)</sup> HCW having initial anti-HBs titres of less than 10 mIU/ml should be investigated for HBV infection and if negative,they should be offered second HBV vaccination and if negative,they should be diagnosed as true HBV vaccine”non-responder<sup>(18)</sup>

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