Screening Of Anti-HBS Levels And Evaluation Of Efficacy In HBV Vaccinated Medical Students. A New Version

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Abstract

Introduction: Hepatitis is an inflammation of the liver. Hepatitis B virus infection is potentially life threatening and is a major global health problem. WHO reported around 2billion people infected with HBV and 500,000 – 700,000 people annually die of HBV related diseases .[1] HBV infection deaths due to cirrhosis worldwide is around more than 235,000 cases and around 328,000 deaths due to liver cancer.[2] The need of screening of anti-Hbs antibody levels in view of efficacy of anti-Hbs antibody levels following pre and post Hepatitis B vaccination and the need of booster doses especially in medical students who are at risk during clinical exposure .

Objective: 1.To assess the level of anti HBs IgG antibodies in vaccinated medical students in a tertiary care teaching hospital.
2. To evaluate the need for boosters and the protective levels against the disease.

Method: It is a cross sectional study. Among 154 medical students, 110 medical students were included. 110 medical students who were fully vaccinated with three doses of HBV vaccine and followed up after 1-2yrs were included in the study The main exclusion criteria includes previous exposure to hepatitis B virus infection, those have not taken the complete course of vaccination and those who were not willing to participate in the study. After Institutional Ethical Committee approval a written informed consent was obtained from the subjects participating in the study. Data were collected from a structured self- administered questionnaire and analysed using SPSS version 2.1 software

Results: A total of 154,110 MBBS student across different years participated in this study. A total of 58(52.7%) male and 52 (47.3%) females participated in the study. The concentration of HBV antibody levels varies with gender. Around 10 to 100mIU/L seen in 9(52.9%) male and 8(47.1%) in female. And a concentration >100mIU/L among 43(46.2%) males and 50(53.8%) the antibody titre in the HBsAg immunized individuals.
The exposure during clinical practice showed a concentration of 10-100mIU/L in 10(58.8%) and >100mIU/L are 37(39.8%). Even when there is no clinical exposure the concentration 10-100mIU/L is 7(41.2%) and >100mIU/L is 56(60.2%).
This shows the Hbs antibody levels varies depending upon the individual immune responses and are independent of clinical exposure The duration of vaccination and concentration of HbsAb level <16 months in 10 to 100mIU/L concentration show a mean + SD of 14.8+2.6 and >16 months is 1.3+0.6 and the concentration >100mIU/L in <16 months showed mean + SD 14.4+2.4 and >16 months with >100mIU/L is 1+0.4, hence overall the immunity level are maintained throughout with significant antibody levels.

Keywords: Hepatitis B vaccination, Anti-Hbs antibody, Medical students. Screening of anti-HBs levels and evaluation of efficacy in HBV vaccinated medical students.

INTRODUCTION:

Hepatitis is inflammation of the liver. Hepatitis B virus infection is potentially life threatening and is a major global health problem. WHO reported around 2billion people infected with HBV and 500,000 – 700,000 people annually die of HBV related diseases .[1]HBV infection deaths due to cirrhosis worldwide is around more than 235,000 cases and around 328,000 deaths due to liver cancer.[2]

Hepatitis B virus (HBV) is a DNA virus belonging to hepadnavirus family, infecting liver cells (hepatocytes). The virus gain entry through percutaneous route i.e puncture or lacerations or mucosal exposure to infected blood or body fluids. Other mode of transmission includes vertical transmission, sexual intercourse, tattooing, drug users by sharing needles immune compromised people like diabetes and in health care, dialysis, blood transfusion, needle pricks while handling patients and emergency medical care without proper protection etc,.

Persons those who are at risk for acquiring HBV infection should be screened for seromarkers HBsAg, Anti-HBs, and Anti-HBc so that they can receive proper vaccination or treatment and can prevent from further complications.

Hepatitis B virus infection persisting in a person more than 6 months are called as carriers. Hepatitis B is considered as an occupational hazard for health care workers as they frequently come in contact with blood and bodily fluids of infected individuals. It is considered more dangerous than Human Immunodeficiency Virus (HIV). But fortunately, vaccines are available against hepatitis B virus. Hepatitis B vaccination is included in national immunization schedule. In addition to that, the vaccination is made mandatory for health care workers. Hepatitis B vaccine is a recombinant vaccine and is given in three doses, intramuscularly at 0, 1 and 6 months

VACCINATION& AB STATUS IN EXPOSED	**TREATMENT**		
	Source HbsAg +	Source HbsAg -	Source- Unknown/NA testing
UNVACCINATED	HBIGs x 1 and initiate HB vaccine series	Initiate HB vaccine series	Initiate HB vaccine
VACCINATED - Serum anti-HBs ≥10mIU/mL	No treatment	No treatment	No treatment
Serum anti-HBs < 10 mIU/mL	HBIG x 1 and revaccination or HBIG x 2**	No treatment	If high risk , treat as if HBsAg positive
AB RESPONSE UNKNOWN **Test exposed person** anti-HBs ≥ 10 mIU/ML,	Test exposed person No treatment.	No treatment	No treatment.
anti-HbS < 10 mIU/mL,	Administer HBIG x 1 and vaccine booster	No treatment	Administer HBIG x 1 and vaccine booster

REVIEW OF LITERATURE: According to the World Health Organization (WHO), two billion people have been infected with the hepatitis B (HB) virus (HBV) worldwide, and more than 240 million are chronic carriers .[3] Fortunately, the infection due to HBV is preventable by vaccine. In 1991, WHO recommended to include the HBV vaccine in the national immunization programs especially in those countries with prevalence of 8% and above.[4] The first vaccine of HBV is the purified and formalin-inactivated hepatitis B surface antigen (HBsAg), which are harvested from the plasma of chronic HBV carriers .[5-8] From 1981, the plasma derived vaccines have been used in many countries.

These plasma derived vaccines cannot meet the demand, hence a recombinant expression of HBsAg was designed in recombinant yeast.[9,10]
The minimum protective level of anti-HBs is 10 IU/ml.[11] The protection provided by the recombinant HBV vaccine is controversial, certain studies have shown that a three or four does of a HBV vaccine provides a protection for nearly 20 years.[12] Even though it is not routine to screen the anti-HBs levels in the immunized individuals, it is always recommended to screen in case of health care providers, HIV and other immuno compromised patients and if the level is less than 10 mIU/mL then a booster dose should be administrated .[13] However in many health care setups, the vaccinated health care providers are not screened for anti-HBs levels. The efficacy of vaccine and level of protection they have is questionable. Hence, in the present study, an attempt is to evaluate the efficacy of HBV vaccination among the medical students who have taken the three routine doses of HBV vaccinations.

AIM AND OBJECTIVE

1. To assess the level of anti HBs IgG antibodies in vaccinated medical students in a tertiary care teaching hospital.
2. To evaluate the need for boosters and the protective levels against the disease.

MATERIAL AND METHODOLOGY

110 medical students who were fully vaccinated with three doses of HBV vaccine and were followed up after 1-2yrs were included in the study. Among 154 medical students, 110 medical students were included. The main exclusion criteria includes previous exposure to hepatitis B virus infection, those have not taken the complete course of vaccination and those who are not willing to participate in the study.

Study design: Cross-sectional study.

Estimation of anti-HBs level

The study was started by obtaining the approval from the Institutional Ethical Committee. A written informed consent was obtained from the subjects participating in the study. The status of the individual was assessed from a pre-coded questionnaire containing their details such as name, age, sex, positive HbsAg parent, organ transplant, blood transfusion, clinical exposure and hepatitis B vaccination status.

Under strict aseptic condition 3ml of blood was collected from eligible candidates in a test tube. Blood centrifuged at 3000 rpm, the serum was separated and was stored in a vial at 20degree C. The evaluation of anti HBs IgG titre level was done by Enzyme Linked Immunosorbent Assay (ELISA) method.

RESULTS AND DISCUSSION:

A total of 154, 110 MBBS student across different years participated in this study. A total of 58(52.7%)male and 52 (47.3%)females participated in the study represented in Table 1 and Fig 1.Of 110 medical students 103(97.3%) with vaccination records and 3(2.7%) do not have their vaccination records . The HBV antibody level varies in different studies. Anti-HBs is an important serological marker that is used to assess vaccine induced immunity to HBV.

Among the health care worker, the HBV infection is high (40–65%) in comparison to the developed countries which account for only 10% mainly because of immunization and post-exposure prophylaxis .[14] Hence, we can understand the importance of the vaccination in the health care worker. It has been found that there are many factors that influence the effectiveness of vaccination in the individuals.[15] In India, not many studies have been conducted among the medical students about the efficacy of the vaccination.

In the present study, an attempt has been made to screen for HBsAb to find the effectiveness of the vaccination among the medical students. In the present study, all the students showed good levels of serum HBsAb levels, which is above 200 mIU/ml. Least level being 20 mIU/ml and highest being 230 mIU/ml. Thus, in the present study, all the students showed the protective level of antibodies indicating the safety of them against HBV infection.

The medical students who completed HBV vaccination are cross checked with their medical records showed 107 (97.3%) are fully vaccinated whereas 3(2.7%) of medical students did not have any medical records and were sure about complete vaccination represented in Table 3 and Fig 3.

The concentration of HBV antibody levels varies with gender. Around 10 to 100mIU/L levels seen in 9(52.9%) male and 8(47.1%) in female. And a concentration >100mIU/L among 43(46.2%) males and 50(53.8%) female and there is no significant p-values which shows there is increase in concentration level following completely vaccinated medical students with good immunity, which is shown in Table 4. Andrea et al study showed significant increased immunity levels in females when compared to males which in correlation with our study.[16]

The association between the clinical exposure and concentration is given in table 5. The exposure during clinical practice with concentration of 10-100mIU/L is 10(58.8%) and >100mIU/L are 37(39.8%) and there is no significant p-value. Even when there is no clinical exposure the concentration 10-100mIU/L is 7(41.2%) and >100mIU/L is 56(60.2%), which shows the concentration levels are more in non-exposed medical students and there is no statistical significance for the same.

The association between the concentration and the clinical exposure is more than 100mIU/L among 56(60.2%) non-exposed medical students when compared to 36(39.8%) among exposed medical students such as bodily fluids. And the concentration between 10-100mIU/L among 7(41.2%) non-exposed medical students when compared to 10(58.8%) among exposed medical students, which is statistically not significant. This show the Hbs antibody levels varies depending upon the individual immune responses and are independent of clinical exposure.

The duration of vaccination and concentration of HbsAb level <16 months in 10 to 100mIU/L concentration show a mean $\pm$ SD of 14.8$\pm$2.6 and >16 months is 1.3$\pm$0.6 and the concentration >100mIU/L in <16 months showed mean $\pm$ SD 14.4+2.4 and >16 months with >100mIU/L is 1$\pm$0.4, whose p-value is 0.070 which is not statistically significant, hence overall the immunity level are maintained throughout with significant antibody levels. Hence we conclude there is no additional requirement of booster doses of HBV vaccination but it is mandatory to follow strict HBsAb titre before clinical exposure and should be followed up every 5 years. And if the concentration is less than 10mIU/L, those students must be considered for revaccination.

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among exposed medical students, which is statistically not significant. This shows the Hbs antibody levels varies depending upon the individual immune responses and are independent of clinical exposure.

The duration of vaccination and concentration of HbsAb level (Table 7) <16 months in 10 to 100mIU/L concentration show a mean ± SD of 14.8±2.6 and >16 months is 1.3±0.6 and the concentration >100mIU/L in <16 months showed mean ± SD 14.4+2.4 and >16 months with >100mIU/L is 1±0.4, whose p-value is 0.070 which is not statistically significant, hence overall the immunity level are maintained throughout with significant antibody levels. Hence we conclude there is no additional requirement of booster doses of HBV vaccination but it is mandatory to follow strict HBsAb titre before clinical exposure and should be followed up every 5 years. And if the concentration is less than 10mIU/L, those students must be considered for revaccination.

Gender:

Table 1: Distribution of study subjects according to gender

Gender	No. of subjects	Percentage
Male	58	52.7%
Female	52	47.3%
Total	110	100%

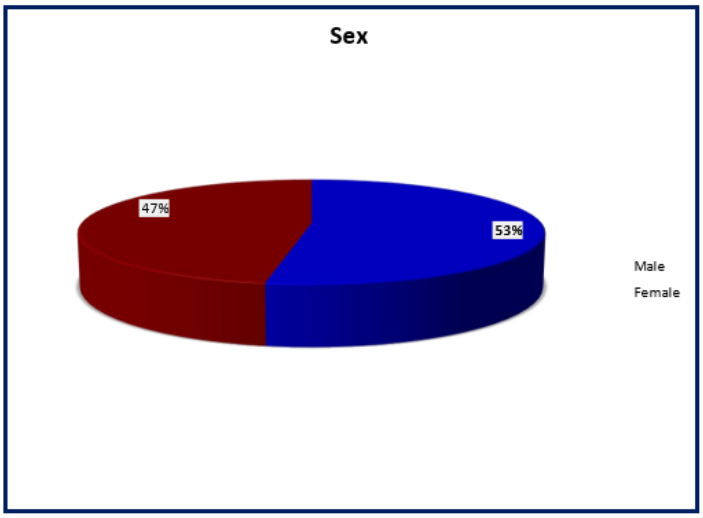

Fig 1: Distribution of study subjects according to Gender

Concentration:

Table 2: Distribution of study subjects according to Concentration

Concentration	No. of subjects	Percentage
0-10	0	0%
10-100	17	15.5%
>100	93	84.5%
Total	110	100%

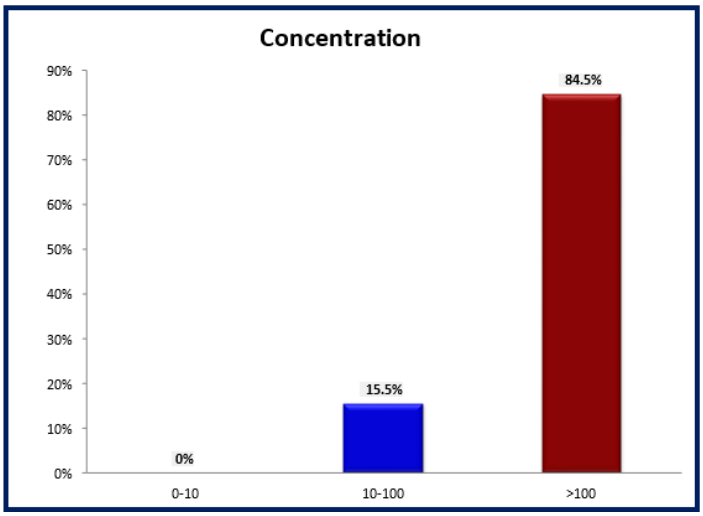

Fig 2: Distribution of study subjects according to concentration

Vaccination status:

Table 3: Distribution of study subjects according to Vaccination status

Vaccination status	No. of subjects	Percentage
With record	107	97.3%
Without records	3	2.7%
Total	110	100%

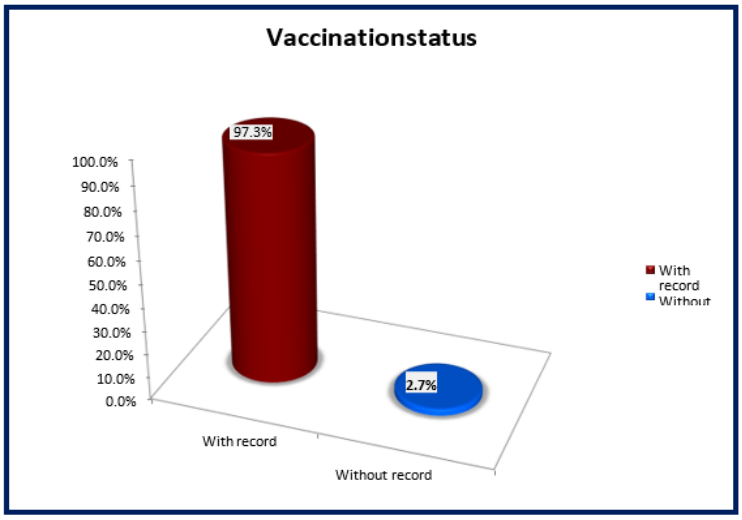

Fig 3: Distribution of study subjects according to Vaccination status

Table 4: Concentration and its association with Gender among the subjects:

Gender	Concentration		X^2 value	'p' value
	10-100	**>100**		
Male	9 (52.9)	43 (46.2)	0.259	0.611
Female	8 (47.1)	50 (53.8)		
Total	17 (100)	93 (100)		

Figures in parentheses are percentage values P<0.05 Statistically Significant

Exposure in clinical practice:

Table 5: Distribution of study subjects according to Exposure in clinical practice

Exposure in clinical practice	No. of subjects	Percentage
Yes	47	42.7%
No	63	57.3%
Total	110	100%

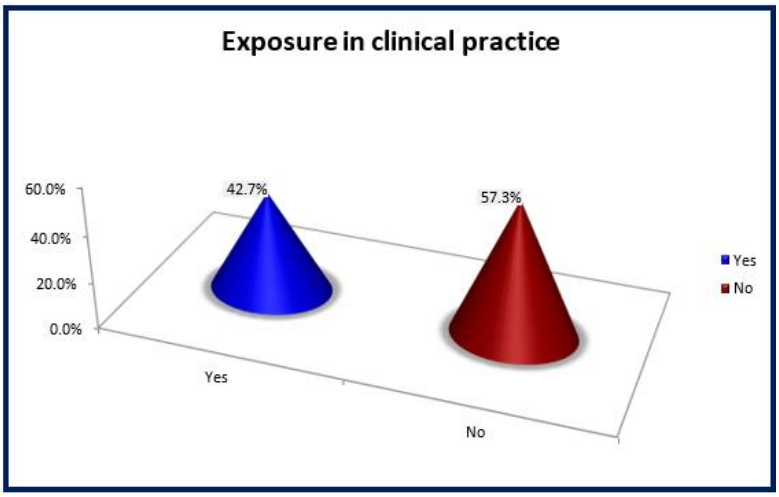

Fig 4: Distribution of study subjects according to Exposure in clinical practice

Table 6: Concentration and its association with Exposure in clinical practice among the subjects:

Exposure in (Clinical practice)	Concentration (mIU/L)		X^2 value	'p' value
	10-100	>100		
Yes	10 (58.8)	37 (39.8)	2.219	0.145
No	7 (41.2)	56 (60.2)		
Total	17 (100)	93 (100)		

Figures in parentheses are percentage values P<0.05 Statistically Significant

Table 7 : Concentration and its association with duration of vaccination among the subjects

Duration (months)	Concentration (mIU/L)		P-value
	10-100 Mean±SD	>100 Mean±SD	
< 16 months	14.8±2.6	14.4±2.4	0.423
>16 months	1.3±0.6	1.±0.4	0.070

CONCLUSION:

From our present study, it can be concluded that the protective level of the anti-HBs is good in vaccinated students. Also the However, it has been shown in different studies that the antibody level decreases as the age progresses .[17] Hence, it is mandatory for the health workers to screen the levels of anti-HBs before entering practical clinical classes and after i.e their graduation and take necessary booster doses.

SUMMARY

Hepatitis B is considered as an occupational hazard for health care workers as they frequently come in contact with blood and bodily fluids of infected individuals. The vaccination is made mandatory for health care workers. Hepatitis B vaccine is a recombinant vaccine and is given in three doses, intramuscularly at 0, 1 and 6 months. An attempt has been made in the present study to identify the levels of anti-HBs to determine the protective efficacy of vaccination among the MBBS students of different years who have completed the full course of the vaccination. In the present study, all the students showed excellent levels of serum HBsAb levels, which is above 200 mIU/ml. Least level being 20 mIU/ml and highest being 230 mIU/ml. Thus, in the present study, all the students showed the protective level of antibodies indicating the safety of them against HBV infection. From the present study, it can be concluded that the protective level of the anti-HBs is good in vaccinated students**.**

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