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ESTIMATION OF HEPATITIS B SURFACE ANTIBODY (HBsAb) AMONG MEDICAL STUDENTS OF BINGHAM UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCES, JOS

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ABSTRACT

Background: As persistence hepatitis B virus infection has grave consequences and no satisfactory treatment is available for Medical students and health care professionals, saving themselves of this menace cannot be over emphasized. However, it is well accepted that Hepatitis B vaccination induces protective level of antibody after complete course of vaccination. This study is aimed to evaluate the immune response after completion of Hepatitis B vaccine and to reduce morbidity and mortality from HBV infection by vaccinating all clinical students in Bingham University College of Medicine and Health Sciences Jos. **Methods:** Rapid diagnostic test for the qualitative detection of HBsAg was conducted after a serum was obtained from blood specimen of 296 Medical students ages 19 to 30 consented for screening from December 2012 – December 2017; all reactive case to HBsAg were counseled and referred for follow-up. Hepatitis B vaccine (Euvax B) was administered to 262 at the deltoid muscles on 0, 1, and 6 months scheduled between the first and the third doses. After the third dose of vaccination, another serum specimen was collected from randomly selected 91 students and analyzed for the estimation of antibody in the individual student. **Result:** 5.7% prevalence of HBsAg was recorded in 296 Medical students where 14 (10.4%) males and 3 (1.9%) females with a p-value 0.0001. Then, 262 received complete vaccination while 17 had incomplete vaccination. Out of the 91 serum specimen, 94.5% had developed antibodies among which 79.12% had high, 15.38% had low and 5.49% had no-responding titers respectively. **Conclusion:** The study showed 94.5% developed protective level of HBsAb after four weeks of last dose vaccination. Therefore, considering the high risk for occupational hazard, all health care professionals working in the hospital environment should be given vaccines for Hepatitis B virus at the start of their career.

KEYWORDS: Antibody estimation, HBsAg, Hep B Vaccine, Seropositivity, Medical students.

INTRODUCTION

Hepatitis B virus has long been recognized as an occupational risk for health care personnel (HCP), including HCP trainees.[1,2] Viral Hepatitis B infection is a major worldwide health problem, especially in sub-Saharan Africa with major cause of liver failure, cirrhosis and hepatocellular carcinoma while about 350 million are chronic carries of this disease.[3–5] HBV is comparatively stable in the environment and remains viable for ≥7 days on environmental surfaces at room temperature.[4] Therefore, HBV is an important candidate for public health measures for prevention, early diagnosis and treatment.[6-8] Health care personnel do not recognize all exposures to potentially infectious blood or body fluids.[2] and even if exposures are recognized, often do not seek post exposure prophylactic management.[9] Although HBsAg has been detected in multiple body fluids, only serum, semen, and saliva have

been demonstrated to be infectious. However, HBV is concentrated most highly in serum, with lower concentrations in semen and saliva. All HBsAg positive persons are infectious, but those who are also HBeAg positive are more infectious because their blood contains high titers of HBV (typically HBV DNA levels of 10^7–10^7 IU/mL).[10-14] In serologic studies conducted in the United States during the 1970s, health care personnel had a prevalence of HBV infection approximately 10 times greater than the general population.[1]

Although, in the mid-1990s, a high proportion of healthy vaccines recipients in clinical trials respond to hepatitis B (Hep B) vaccination, the proportion of responders in the incidence of Hepatitis B viral infection among health-care workers has been lower than that among the general population, particularly among persons with chronic medical conditions.[15,16]

Before hepatitis B vaccination was widely implemented, HBV infection was recognized as a common occupational hazard among persons who were exposed to blood while caring for patients or working in laboratories. Since then, routine hepatitis B vaccination of health-care workers and use of standard precautions to prevent exposure to blood borne pathogens have made HBV infection a rare event in these populations.[17,18]

HBV infection can produce either asymptomatic or symptomatic infection. The average incubation period is 90 days (range: 60 –150 days) from exposure to onset of jaundice and 60 days (range: 40–90 days) from exposure to onset of abnormal serum alanine aminotransferase (ALT) levels.[19,20] The onset of acute disease typically is insidious. When present, clinical symptoms and signs can include anorexia, malaise, nausea, vomiting, abdominal pain, and jaundice. Extra hepatic manifestations of disease (e.g., skin rashes, arthralgias, and arthritis) also can occur.[22] The fatality rate among persons with reported cases of acute hepatitis B is 0.5%–1.0%, with the highest rates in adults aged >60 years; however, because a substantial number of infections are asymptomatic and therefore are not reported, the overall fatality rate among all persons with HBV infection likely is lower.[16,23]

Approximately 95% of primary infections in adults with normal immune status are self-limited, with elimination of virus from blood and subsequent lasting immunity to reinfection.[21-24] No specific treatment exists for acute hepatitis B; supportive care is the mainstay of therapy. Persons who have chronic HBV infection require medical evaluation and regular monitoring.[30-32] Therapeutic agents approved by the Food and Drug Administration (FDA) for treatment of chronic hepatitis B can achieve sustained suppression of HBV replication and remission of liver disease in certain persons.[31]

Hepatitis B vaccine is available as a single-antigen formation and also in combination with other vaccines. Primary Hepatitis B vaccination of adults usually consist of 3 doses of 10 or 20µg of recombinant HBsAg protein administered intramuscularly into the deltoid muscle on a 0, 1 and 6 month schedule.[35,36] The 3-dose vaccine series administered intramuscularly at 0, 1, and 6 months produces a protective antibody response in approximately 30%–55% of healthy adults aged ≤40 years after the first dose, 75% after the second dose, and >90% after the third dose.[37,38] Hepatitis B (Hep B) vaccines have been demonstrated to be safe among persons in all age groups. During 1982 – 2004, an estimated 70 million adolescents and adults in the United States received ≥1 dose of Hep B vaccine. The most frequently reported side effects are pain at the injection site (3% - 23%) and temperature of > 37.7°C (>99.9°F) (1% - 6%).[17]

Immunocompetent adults and children who have vaccine-induced anti-HBs levels of ≥10m/U/ml 1 – 2 months after having received a complete ≥3 dose Hep B vaccine series are considered seroprotected and deemed vaccine responder. Vaccines efficacy studies have demonstrated protection against acute and chronic disease in immunocompetents vaccine responders. Vaccine – induced seroprotection is a useful surrogate of vaccine efficacy. Postvacination seroprotection is achieved in approximately 92% of Hepatitis aged <40 years and 84% of Hepatitis aged ≥40 years.[34] After age 40 years, the proportion of persons who have a protective antibody response after a 3-dose vaccination regimen declines below 90%, and by age 60 years, protective levels of antibody develop in only 75% of vaccinated persons.[38]

Justification

Considering the high risk of exposure to viral hepatitis infection in health care personnel, chronic hepatitis infection has been a common cause of morbidity and mortality associated with liver failure, cirrhosis and liver cancer. The essence of this screening and vaccination exercise is to find out the possible existence of the HBV infection among medical students who stand the risk as healthcare providers of acquiring the infection and to evaluate the immune response after completion of hepatitis B vaccination in Medical Students whether antibodies are established as a preventive and control measures.

AIM/OBJECTIVE

The study is aimed to estimate the prevalence of Hepatitis B surface Antigen and evaluate the immune response Medical Students after completion of hepatitis B vaccination whether antibodies are established (with the protocol of three doses, [0-1-6] schedule).

MATERIALS AND METHODS

This study was a cross-sectional study whichinvolved both male and female Medical students at the Bingham University College of Medicine and Health Sciences.

Determination of sample size was obtained from a study with 90% previous percentage reported by CDC, MMWR *et al*., 2013 of a proportion of those who developed antibody after the third dose of HBV vaccination. Blood specimen of 4-5mls was collected through venepucture in an EDTA tube sample container from 296 Medical students with the help of a laboratory Scientist ages 19 to 30 consented for screening from December 2012 – December 2017 at the University College of Medicine and Health Sciences processed to obtain serum for laboratory analysis. Each serum specimen was screened with the rapid test kit for qualitative detection of HBsAg [Lab ACON Biotest (Hangzhou) co., Ltd China] before vaccination; those who were found to be reactive to HBsAg were counseled and referred for confirmation and follow-up at the University Teaching Hospital. Hepatitis B vaccine (Euvax B) was administered to 262 students who were negative to the disease at the deltoid muscles on 0, 1, and 6 months scheduled between the first and the third doses. After the third dose of vaccination, another serum specimen was collected from randomly selected 91 students and analyzed using [HBsAg Ab ELISA Test Kit] for the estimation of antibody in the individual student. Remaining specimens were discarded along with the samples from other people who took part in this study.

Data analysis

Data was entered into Microsoft offices excel (97 - 2003) and analyzed using the chi square test of fitness focusing on evaluating the immune response after completion of Hep B vaccination in Medical Students.

Confidentiality and Ethical issues

Ethical clearance for the study (research) was sought for and obtained from the Ethical committee of Bingham University Teaching Hospital, Jos before commencement of the research [*NHREC/21/05/2005/00261*].

RESULTS

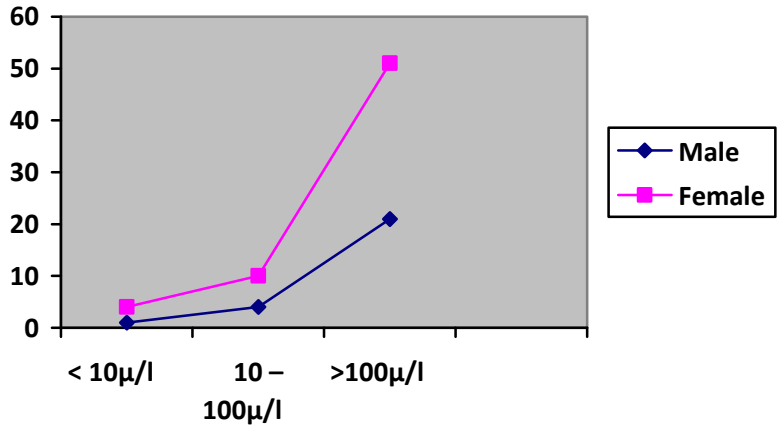
In our study, we recorded a prevalence rate of HBsAg seropositive in the Medical students to be 5.7% where female had 17.6% and male had 82.4%. This showed that the male had a higher prevalence rate of HBsAg seropositivity than the female (see table 1). There was a 94.5% seroconversion recorded in medical students among whom had 79.12% high response (Anti-HBs > 100IU/l), 15.38% low responders (Anti-HBs < 10IU/l), 5.49% non-responders after four weeks vaccination. The study showed a protective level of Anti-HBsb amongs medical students to be 80.77% in males and 78.46% in females respectively.

Table 1: Prevalence of HBsA among Medical students.

		HBsAg Result	
Sex	**Reactive (%)**	**Non-Reactive (%)**	**Total (%)**
Female	3 (1.9)	159 (98.1)	162 (100)
Male	14 (10.4)	120 (89.6)	134 (100)
Total	**17 (5.7)**	**279 (94.3)**	**296 (100)**

Table 2: Estimation of Anti-HBsAb by Gender after four weeks of administering third dose of vaccination.

	Anti-HBsAb Titre value				
	< 10µ/l	**10 – 100µ/l**	**>100µ/l**	**Total**	**P-value**
Female	4(6.15%)	10(15.38%)	51(78.46%)	65	<0.05 (0.192)
Male	1(3.85%)	4(15.38%)	21(80.77%)	26	<0.05 (0.192)
Total	**5**	**14**		**72**	**91**



DISCUSSION

It is well accepted that hepatitis B vaccination induces protective level of antibody after complete course of vaccination. So post vaccination screening should be done in health care professionals within 1 – 6 months of primary vaccination.[32] In our study, post vaccination screening was done between 4 – 6 weeks.

In our study, we recorded a prevalence rate of HBsAg seropositive in the Medical students to be 5.7% where female had 17.6% and male had 82.4%. This showed that the male had a higher prevalence rate of HBsAg seropositivity. This study concord with a study reported by Peters (2017) showing a 5.2% and is less than 9.2% reported by Isa (2017) in North Central Nigeria among students in Jos and Zaria respectively.[33,42]

In a study conducted by Moh'd Abdul *et al.,* in Bangladesh reported that health professionals had protective level of anti-HBsb in 85.88% males and 92.31% female of which our study tends to show a protective level of Anti-HBsb in 80.77% males and 78.46% females.[34]

In our study, there is a 94.5% seroconversion in medical students among whom had 79.12% high response (Anti-HBs > 100IU/l), 15.38% low responders (Anti-HBs < 10IU/l), 5.49% non-responders after four weeks vaccination which tends to agree with the study conducted by Sunita *et al.,* 2011 that there was high response of 100% seroconversion among whom 80% had high response, 20% were hypo responders and non-responder was not found in their study.[35]

Krugman *et al.,* found 99% of subjects developed protective level of HBsAb after vaccination after 1 month of last dose in their study while we recorded that 94.5% developed protective level of HBsAb after four weeks of last dose vaccination was reported.[18]

The result showed that the protective level of Anti-HBs were higher in individuals at the age of < 25 years as compared with Norouzirad *et al.*, study in Iran. However, regarding low levels of protective HBV antibody during adolescence, some investigators suggested the use of a booster dose of vaccine for adolescence to increase the immunity rate against HBV infection.[36-38]

Although, it was initially thought that Hepatitis B vaccination does not provide indefinite protection; this is no longer considered, previous reports suggested that primary vaccination would provide protection between 5 – 7 years but subsequently it has been appreciated that protection may be provided for at least 25 years due to long term immunity derived from immunological memory in those individuals who showed adequate response to primary hepatitis B vaccination. However, our study suggested that booster dose is required in individuals who have high risk for occupational hazard.[18,35,39-41]

CONCLUSION

As persistence hepatitis B virus infection has grave consequences and no satisfactory treatment is available for medical students and health care professionals, they should take all the preventive measures to save themselves of this menace. All the staff working in the hospital environment should be given vaccination for Hepatitis B virus at the start of their career.

RECOMMENDATION

This finding suggests that provision of free vaccine alone might not ensure increased use of hepatitis B vaccine and that other implementation strategies (e.g., education and training of clinicians and standing orders) are needed to prompt providers to offer vaccination to adults and therefore be educated regarding universal precautions focusing on behavioral change rather than posting scary messages to the populace.

One strategy demonstrated to be effective at increasing vaccination coverage among adults as part of routine prevention services in settings in which a high proportion of adults have HBV risk factors.

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CONFLICTING INTEREST

We declared no conflict of interest that could lead to bias or plagiarism in our study.

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