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Original Article

Microbiology Section

Protective Antibody Titer against Hepatitis B in Healthcare Workers: A Cross-sectional Study from Tertiary Care Hospital of Kashmir

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ABSTRACT

Introduction: Hepatitis B is not only the most transmissible blood borne viral infection, but also the only one that is preventable by vaccination. In developing countries, Hepatitis B vaccination coverage among Healthcare Workers (HCWs) is very low for various reasons.

Aim: To evaluate Hepatitis B Virus (HBV) immunisation status and Hepatitis B surface antibody (anti-HBs) titer among HCWs in a tertiary care hospital in Kashmir.

Materials and Methods: This cross-sectional study was conducted in the Department of Microbiology, Government Medical College, Srinagar, India from April 2019 to June 2019. Serum samples were collected from 196 HCWs and their vaccination history was collected. Those who had taken all three doses of hepatitis B were considered to be fully vaccinated those that had taken two doses as partially vaccinated. Triple serology was done for all which included testing for HBV, Hepatitis C Virus (HCV) and Human Immunodeficiency Virus (HIV) infection, one HCW turned out to be Hepatitis B Surface Antigen (HBsAg) positive and was dropped out of study. Those negative (195/196) were further tested for anti-HBs titer by enzyme immunoassay method. Parametric data were expressed as mean±Standard Deviation (SD) and categorical values as percentages.

Results: Out of 195 HCWs selected for the study, 104 were males and 84 (43%) were females with mean age 38.4±6.9 years. Among them fully vaccinated were 46 (23.5%), partially vaccinated were 91 and not vaccinated were 65 (33.33%). Anti-HBs titers were protective in 54 (27.7%) which belonged 81.5% (44/54) to vaccinated category and 18.5% (10/54) to partially vaccinated category.

Conclusion: Fully vaccinated HCWs (95.6%) had a protective antibody titer but unfortunately there are low vaccination rates among HCWs. There is a need for well-planned and clear policies for HBV screening and vaccination in HCWs, especially those who are at a greater risk of exposure to blood or other potentially infectious material.

Keywords: Enzyme-linked immunosorbent assay, Hepatitis B surface antibody, Viral infection

INTRODUCTION

The HBV is the leading cause of acute and chronic liver disease throughout the world [1]. The recent figures from the World Health Organisation (WHO) shows that 296 million people were living with chronic hepatitis B infection in 2019, with 1.5 million new infections each year. In 2019, an estimated 820, 000 people died mostly from cirrhosis and hepatocellular carcinoma that was attributed to HBV infection [2]. With the highest risk of transmission among blood borne pathogens, hepatitis B poses a great risk to the people at risk like the healthcare professionals. Reports have indicated that a disturbing figure of 70% HCWs in intermediate or hyper endemic countries encounter needle stick injury with an average of two needle pricks per year. The concerning fact is that among them only 10-30% are only reported to the authorities [3-6]. The chances of acquiring hepatitis infection also depends on the Hepatitis B Envelope Antigen (HBeAg) status of the source which is a marker of infectivity as well [7].

Fortunately enough, this disease is vaccine preventable and vaccines are available throughout the globe. WHO recommends that all infants receive the HBV vaccine as soon as possible after birth, preferably within 24 hours, followed by 2 or 3 doses of hepatitis B vaccine atleast four weeks apart to complete the vaccination series. Protection lasts atleast 20 years and is probably lifelong. WHO does not recommend booster vaccinations for persons who have completed the three-dose vaccination schedule [2]. The only easily measurable correlate of the vaccine induced protection is the anti-anti-HBs concentration serological test. An anti-HBs titer of 10 mIU/mL achieved three months after completing the primary vaccination is considered as a protective titer [8].

Hence, the purpose of the study was to find the hepatitis B vaccination status of the HCWs and to find the Anti-HBs titers in these HCWs.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Microbiology, Government Medical College, Srinagar, India. It was done over a period of three months from April 2019-June 2019 after obtaining consent from the Institutional Review Board (ref no:IRBGMC/mic10).

Inclusion criteria: HCWs who consented to submit their serum sample and gave their written consent were included.

Exclusion criteria: HCWS who did not gave consent were excluded.

Study Procedure

Total of 196 HCWs were involved in this study. After written informed consent taken from all the subjects, blood samples were collected from 196 HCWs and their vaccination history and other demographic data such as age, gender, vocation etc., was taken. HCWs were divided into five categories: doctors, nursing staff, laboratory technical staff, medical students and sweepers/Nursing Orderlies (NOs).

Participants were tested for HBV and HCV infection by Enzyme Linked Immunosorbent Assay (ELISA) and Human Immunodeficiency Virus (HIV) by rapid antibody tests. All the samples were initially screened for differential detection of HIV-1 and HIV-2 antibodies using a highly sensitive, rapid immunoassay COMBAIDS-RS ADVANTAGE-ST (ARKRAY Healthcare, Noida, India) which detects HIV-1 and 2 and is an immunodot assay employing same principle as enzyme immunoassay. Hepatitis C antibodies were detected by ELISA (HCV

ELISA OSCAR Medicare, New Delhi, India) employing conserved antigenic segments of core, NS3, NS4 and NS5 antigens. Hepatitis B infection was detected by using ELISA (HBsAg ELISA OSCAR Medicare, New Delhi, India) for detection of HBsAg. Confidentiality of the information was maintained.

Among these one HCW turned out to be HBsAg positive and was dropped out of study. Those negative (195) for triple serology were further tested for anti-HBs titer by enzyme immunoassay method (DIA.PRO, Milano, Italy). An anti-HBs titer of 10 mIU/mL was considered as a protective titer.

STATISTICAL ANALYSIS

Parametric data were expressed as mean values±Standard Deviation (SD) and categorical values were presented as percentages.

RESULTS

Out of 196 HCWs who consented for this study, only 195 were subjected to anti-HBs testing since one HCW turned out to be HBsAg positive. All participants were negative for HCV and HIV. The baseline characteristics of HCWs are given in [Table/Fig-1]. Out of 195 included, 46 (23.6%) were fully vaccinated that is who had completed all three doses of vaccination, 84 (43%) were partially vaccinated that is who had missed their 3rd dose and 65 (33.3%) were unvaccinated. There was no HCW in the present study who had taken only one dose of vaccination.

Variables	Fully vaccinated (n=46)	Unvaccinated (n=65)	Partially vaccinated (n=84)
Age (in years) (mean±SD)	38.4±6.9	38.54±5.9	29±10.7
Gender (n)			
Male	16	50	38
Female	30	15	46
Healthcare Workers (HCW)			
Doctors	28	20	34
Nursing staff	10	15	13
Technical staff	06	22	27
Students	1	0	04
Cleaners/Nursing Orderlies (NOs)	01	08	06

[Table/Fig-1]: Baseline characteristics of Healthcare Workers (HCWs). (Table showing the categorisation of HCWs as well); (N=195)

Out of 46 fully vaccinated HCWs, 44 (44/46) had protective anti-HBs antibody titer while 2 (2/46) didn't have protective antibody titer. These two HCWs had received their last vaccination dose more than 10 years. back. Rest all the vaccinated HCWs had taken vaccination within last 10 years. Of the 44 who had protective antibody titers, 12 (12/44) had antibody titer between 10-100 mIU/mL and 32 (32/44) had antibody titer of more than 100 mIU/mL. Among partially vaccinated group also 10 (10/84) had protective antibody titers and all of them between 10-100 mIU/mL. None of the unvaccinated HCWs had a protective antibody titer [Table/Fig-2].

Parameters	Fully vaccinated (n=46)	Partially vaccinated (n=84)	Unvaccinated (n=65)
Anti-HBs levels <10 mIU/mL	2	74	65
Anti-HBs levels 10-100 mIU/mL	12	10	0
Anti-HBs levels >100 mIU/mL	32	0	0

[Table/Fig-2]: Anti-HBs titers in Healthcare Workers (HCW) showing protective titers in 44/46 vaccinated HCWs.

DISCUSSION

The HCWs are at a very high-risk of contracting HBV infection because of the environment they work in. The risk of acquiring HBV by HCWs is determined by various factors, the main ones being risk of exposure to needle stick injuries, sharps, blood or blood products and the duration they spend in such high-risk areas [9]. Hepatitis B is a vaccine preventable disease, the effectiveness of the vaccination can be measured and anti-HBs titer is an efficient serological marker for the same [10] Those immunocompetent people who are able to achieve anti-HBs levels of ≥10 mIU/mL 1-2 months after receiving a complete ≥3 dose HBV vaccine series are labelled as vaccine responders.

Ironically, even after being a vaccine preventable disease, authors still find vaccine hesitancy among HCWs and there is a huge chunk of HCWs who aren't vaccinated. In the [Table/Fig-3], authors presented a comparison of results between current study and similar studies from around the globe [7,11-13]. There is a difference in vaccination coverage among various groups of HCWs with doctors having the highest vaccination coverage in most of the studies. In the present study, doctors comprised 61% (28/46) of the vaccinated HCWs followed by nursing staff 21.7% (10/46). This difference in the varied vaccination status is probably because of their education and knowledge regarding the importance of vaccination.

Study	Place of study	Fully vaccinated against HBV (%)	Unvaccinated (%)
Batra V et al., [7]	Rajasthan, India	49.6%	46.1%
Fazili Anjum B et al., [11]	Kashmir, India	25.76%	51.24%
Soomar SM et al., [12]	Karachi, Pakistan	61.84%	38.16%
Mohanty SS et al., [13]	Odisha, India	70%	20%
Present study	Kashmir, India	23.5%	33.33%

[Table/Fig-3]: Comparison between vaccination status against HBV among HCWs from various studies [7,11-13].

In the present study, among the fully vaccinated group, 44/46 (HCWs) had a protective antibody titer of more than 10 mIU/mL. Two vaccinated subjects who didn't have a protective antibody titer had taken their last dose of vaccine more than 10 years back, the rest of vaccinated HCWs had taken the last dose within 10 years. According to the WHO, the fully vaccinated subjects who have antibody titer in the non protective range still have an immunological memory that protects them against HBV infection [14]. Studies have shown that vaccination in adults is effective in protecting 90-95% of them from HBV infection [15]. According to Centres for Disease Control (CDC), revaccination with ≥1 dose of HBV vaccine for non response subsequent to the primary series increases the proportion of persons achieving vaccine-induced seroprotection and it further mentions that persons who have measurable but low (i.e., 1-9 mIU/mL) levels of anti-HBs after the initial series have better response to revaccination than persons who have no measurable anti-HBs [8,16,17].

Since HCWs are at high-risk of acquiring HBV, it should be an institutional policy to check the hepatitis B status of its workers and periodic check-ups of their anti-HBs levels. A proposal was forwarded to the concerned authorities of the institute where we recommended the complete immunisation (3 doses) of the unvaccinated HCWs and completion of the dosing schedule in partially vaccinated HCWs. The CDC recommends that the incompletely vaccinated Healthcare Personnel (HCP) should receive additional dose(s) to complete the vaccine series [8]. The vaccine series does not need to be restarted for HCP with an incomplete series; however, minimum dosing intervals should be needed. Minimum dosing intervals are four weeks between the first and second dose, eight weeks between the second and third dose, and 16 weeks between the first and third dose [8]. In addition, awareness programs need to be conducted among HCWs emphasising the importance of vaccination and all measures to improve the vaccine compliance should be adopted.

Limitation(s)

This study was relying on the verbal information regarding vaccination provided by HCWs and not checking the vaccination certificates.

CONCLUSION(S)

There is a need for well-planned and clear policies for HBV screening and vaccination in HCWs, especially those who are at a greater risk of exposure to blood or other potentially infectious material. Further studies are needed to test anti-HBs titers in HCWs and they are to be encouraged to report needle stick injuries so that necessary action and tests can be conducted in time.

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