

## HBV after Occupational Exposure in Health Care Workers Is Preventable

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### Abstract

**Introduction:** Chronic hepatitis B Virus (HBV) infection has capability of causing various impact on hepatic and extra-hepatic manifestations. It usually remains in inactive carrier in majority of patients but in significant number of patients can cause chronic hepatitis, cirrhosis or hepatocellular carcinoma (H.C.C). There are various routes of transmission for HBV, many of them are well documented like unsafe needle practices including occupational exposure of health care workers and vertical transmission.

**Aims and Objectives:** To determine the transmission of HBV in health care workers due to occupational exposure.

**Materials & Methods:** It was prospective study conducted at Department of Medical

Gastroenterology, Post Graduate Institute of Medical Sciences (PGIMS), Rohtak, over a period of three years from 1<sup>st</sup> January, 2022 to 31<sup>st</sup> December, 2024. During this time period 180 health care workers (HCW) who reported in department for occupational exposure with blood of confirmed hepatitis B patients were enrolled in the study. All these health care workers were either partially or not vaccinated against HBV. All of them were given 0.06 ml/Kg of hepatitis B immunoglobulin (HBIG) along with first dose of HBV vaccine within 12 hours of exposure, followed by full course of HBV vaccination i.e. 0,1,6 months three doses. Out of these 180 HCW, only 100 got themselves checked for HbsAg and HBV DNA quantitative test after three months of post-exposure for determining transmission of HBV. Hence, data

pertaining to these 100 HCW was analysed in final analysis.

**Results:** All these 100 health care workers who received both HBIG and HBV vaccine and got tested for HbsAg and HBV DNA quantitative were found negative for both these tests, meaning by nil transmission of HBV due to occupational exposure.

**Conclusion:** Timely interventions after occupational exposure are effective but as prevention is better than cure, thus all health care workers, at the time of joining of job, should be mandatory vaccinated for HBV.

**Keywords:** Hepatitis B virus; Per cutaneous transmission; Health care worker; HBV DNA Quantitative test; HbsAg

## Introduction

Chronic Hepatitis B Virus (HBV) infection has capability of causing hepatic and extra-hepatic manifestations. It usually remains in inactive carrier in majority of patients but in significant number of patients can cause chronic hepatitis, cirrhosis or Hepatocellular Carcinoma (H.C.C). There are various routes of transmission for HBV, many of them are well documented like unsafe needle practices including occupational exposure of health care workers and vertical transmission. The main routes of HBV transmission mainly include percutaneous or per mucosal exposure to HBV-containing body fluids. The most important source of infection is blood [1]. HBV transmission occurs through different kind of human contact, including vertical transmission from mother to newborn, sexual contact, close household contact, needle sharing, and occupational exposure (horizontal transmission) [2,3]. According to available information, a needle stick injury from a patient infected with Hepatitis B can result in a

significant risk of transmission, with estimates ranging from 6% to 30% depending on the source patient's viral load (particularly the presence of HbeAg), highlighting the importance of immediate Post-Exposure Prophylaxis (PEP) for healthcare workers who experience such an injury. In comparison to other blood borne pathogens like HIV, Hepatitis B has a considerably higher risk of transmission through a needle stick injury. The presence of Hepatitis B e antigen (HbeAg) in the source patient significantly increases the transmission risk. Healthcare workers fully vaccinated against Hepatitis B have a significantly reduced risk of infection following a needle stick injury. In case of needle stick injury, wash the wound site thoroughly with soap and water and depending on vaccination status and the source patient's viral load, healthcare provider may be recommended a course of Hepatitis B immunoglobulin and/or additional Hepatitis B vaccine doses.

## Aims and Objectives

To determine the transmission of HBV in health care workers due to occupational exposure.

## Material and Methods

It was prospective study conducted at Department of Medical Gastroenterology, Post Graduate Institute of Medical Sciences (PGIMS), Rohtak, over a period of three years from 1<sup>st</sup> January, 2022 to 31<sup>st</sup> December, 2024. During this time period 180 Health Care Workers (HCW) who reported in department for occupational exposure with blood of confirmed hepatitis B patients were enrolled in the study. All these health care workers were either partially or not vaccinated against HBV. All of them were given 0.06 ml/Kg of Hepatitis B Immunoglobulin (HBIG) along

with first dose of HBV vaccine within 12 hours of exposure, followed by full course of HBV vaccination i.e. 0,1,6 months three doses. Out of these 180 HCW, only 100 got themselves checked for HbsAg and HBV DNA quantitative test after three months of post-exposure for determining transmission of HBV. Hence, data pertaining to these 100 HCW was analysed in final analysis.

### Statistical Analysis

All the data was entered in Microsoft Excel and was analysed using SPSS 15.0 version.

### Observations & Results

In our study group total 180 health care workers who came forward for post-exposure prophylaxis, twenty were fully vaccinated for Hepatitis B i.e. 11.11% and on testing in them for anti Hbs titre for determining effectivity of vaccine, 15 had satisfactory level of above 100 IU/ml and rest 5 whose level was below 100, were given only booster dose of HBV. The rest 160 HCW were either not vaccinated or partially vaccinated for HBV and were given HBIG and full course of HBV. Our study group was a mixed one, in which different strata of HCW were part of it. Majority had incidental needle stick injury, followed by exposure of infected HBV blood in ocular mucosa

or open cuts of HCW. The MBBS stream in view of its large number and being more exposed at various occasions are at more risk for occupational exposure of HBV. The post graduate, senior residents and interns were found to be at maximum occupational exposure, as they form core team for emergency procedures or surgeries, in addition to routine procedures. They have maximum contact period with HBV patients, as they have to carry all the basic work of HBV patients, including taking of samples, Ryle's tube insertion etc. The Nursing officers and operating technicians are also at risk, in view of assisting in operative procedures of HBV patients. The surprising thing was, despite being HCW and having knowledge of HBV infection which was even clearly explained by our team, significant number of them never came for testing of HBV infection for determining occupational transmission of HBV. It implies that they got assured that HBIG and HBV vaccination will give hundred percent protections from HBV. All these 100 health care workers who received both HBIG and HBV vaccine and got tested for HbsAg and HBV DNA quantitative were found negative for both these tests, meaning by nil transmission of HBV due to occupational exposure ([Table 1-4](#)).

**Table 1:** Showing Distribution of HCW on basis of testing for HBV transmission.

Total Number of HCW	HCW got tested for HBV	HCW not tested for HBV
180 (100%)	100 (56.56%)	80 (44.44%)

**Table 2:** Showing Strata of Health Care Workers having occupational exposure to HBV.

Total Tested HCW	Nursing Officer	Technician	MBBS Student	BDS Student	Intern	M.D. Student	Senior Resident
100 (100%)	14 (14%)	7 (7%)	15 (15%)	3 (3%)	18 (18%)	28 (28%)	15 (15%)

**Table 3:** Showing Distribution of kinds of occupational exposure pattern of HCW.

Total Number of HCW	Needle Stick injury	Ocular exposure	Open wound exposure
180 (100%)	170 (94.44%)	6(3.33%)	4 (2.23%)

**Table 4:** Showing HCW on basis of HBV transmission after Post-exposure Prophylaxis.

Total HCW who got tested for HBV after Post-exposure Prophylaxis	HCW who tested Negative For HBV infection	HCW who tested Positive For HBV infection
100 (100%)	100 (100%)	0 (0%)

## Discussion

Health Care Personnel (HCP) are at risk for a variety of infectious pathogens following exposure to blood or body fluids, including Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV) [4,5]. Hepatitis B is a highly infectious blood-borne pathogen that can remain viable on environmental surfaces for at least one week and can be transmitted even in the absence of visible blood [6,7]. The greatest risk of occupational HBV transmission occurs with a needle stick or sharps-related injury [7]. Most percutaneous exposures result from needles intended for intramuscular or subcutaneous injections (30.5%), or from suture needles (18.7%) [7-10]. Mucosal exposures occur in approximately 22% of trainees per year, but only 17% of those with a mucosal exposure sought consultation from the specialist [7]. Blood exposure carries the highest risk for HBV transmission, due to its higher titers in blood than in other body fluids [5,7]. The cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, and amniotic fluid are considered to present a potential risk of occupational HBV

transmission, but these risks are not well quantified [7]. Other body fluids such as semen, vaginal secretions, saliva, tears, sputum, urine, and vomitus have not been implicated in occupational exposure, unless contaminated with blood [5,7]. Percutaneous exposure has the highest risk for HBV seroconversion in comparison to HCV & HIV, and without postexposure prophylaxis, health care workers who sustained a needle stick injury from a needle contaminated with hepatitis B surface antigen (HBsAg)-positive and hepatitis e antigen (HbeAg)-positive blood had a 22 to 31% risk of developing clinical hepatitis and a 37 to 62% risk of developing serologic evidence of HBV infection [5,7,11,12]. In case of HBsAg-positive/HbeAg-negative blood, the risk of developing clinical hepatitis was lower (1 to 6%), but the risk of developing serologic evidence of HBV infection remained substantial (23 to 37%) [5,7,11]. The decision to administer postexposure prophylaxis to prevent HBV acquisition depends upon type of body fluid involved in the exposure, nature of the exposure (e.g., percutaneous, mucous membrane, or contact with non-intact skin), HBV status of the source patient, HBV and

immunization status of the health care worker and timing of the exposure [7]. Health care worker who has fully completed a hepatitis B vaccine schedule, does not need Hepatitis B Immunoglobulin (HBIG) protection, if anti-HBs titre is above 100 mIU/mL but in case they are less than one booster dose of HBV vaccine is required [13]. In case where HCW has been partially vaccinated or unvaccinated for HBV, then 0.06 ml/kg of HBIG, along with first dose of HBV should be given within twenty- four hours, followed by complete course of HBV vaccination i.e. 0,1,6 months. The HBV DNA quantitative test should be done after four weeks of exposure of occupational exposure, followed by HbsAg test after three months of exposure, for ruling out transmission of HBV. HCW after exposure to an HBsAg-positive or HBsAg-unknown source should refrain from donating blood plasma, organs, tissue, or semen during the six-month follow-up period. Retrospective data from Japan does, however, suggest higher efficacy of hepatitis B vaccine plus HBIG for occupational postexposure prophylaxis when compared to HBIG alone (4% versus 11% infection rate) [14]. Our study group was a mixed one, in which different strata of HCW were part of it. Majority had incidental prick injury, followed by exposure of infected HBV blood in ocular mucosa or open cuts of HCW. The MBBS stream in view of its large number and being more exposed at various occasions are at more risk for occupational exposure of HBV. The post graduate, senior residents and interns were found to be at maximum occupational exposure, as they form core team for emergency procedures or surgeries, in addition to routine procedures. They have maximum contact period with HBV patients, as they have to carry all the basic work of HBV patients, including taking of samples, Ryle's

tube insertion etc. The Nursing officers and operating technicians are also at risk, in view of assisting in operative procedures of HBV patients. The surprising thing was, despite being HCW and having knowledge of HBV infection which was even clearly explained by our team, significant number of them never came for testing of HBV infection for determining occupational transmission of HBV. It implies that they got assured that HBIG and HBV vaccination will give hundred percent protections from HBV. In our study pool, only 11.11% of HCW were already vaccinated for HBV, thus did not require post-exposure prophylaxis but it shows urgent steps to be taken for vaccination of all HCW. The hundred percent successes in preventing HBV transmission after post-exposure prophylaxis in HCW is the real optimistic outcome of our study which implies availability of post-exposure prophylaxis in every health care facility.

## **Results**

All these 100 health care workers who received both HBIG and HBV vaccine and got tested for HbsAg and HBV DNA quantitative were found negative for both these tests, meaning by nil transmission of HBV due to occupational exposure.

## **Conclusion**

Timely interventions after occupational exposure are effective but as prevention is better than cure, thus all health care workers, at the time of joining of job, should be mandatory vaccinated for HBV.

## **Limitation of Study**

In present study, a significant proportion of HCW have not got tested for transmission of HBV, hence if data pertaining to them is also included in final

analysis, then more accurate interpretation can be made. Moreover, HBV viral loads and HbeAg levels were not available for source from which HCW got exposed, was not known. Hence, analysis on this aspect could not be made in the present study.

### Conflict of Interest

The authors declare that there was no conflict of interest and no funding was taken from any source to conduct this research.

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