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# POST - EXPOSURE MANAGEMENT AGAINST HEPATITIS B VIRUS AT THE DENTAL OFFICE – A REVIEW

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## ABSTRACT

The objective of this paper is to review the modalities of management employed following an accidental exposure to the fatal blood-borne pathogen -Hepatitis B virus. An online search of literature was carried out using the keywords: “Hepatitis B”,” Occupational Exposure”, “Post -exposure prophylaxis”. The information about the post -exposure management against hepatitis B virus in dental office was reviewed.

**KEYWORDS**: **Hepatitis B virus, Exposure, Management**

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## BACKGROUND

HBV infection was first identified in 1965 when Blumberg and his co-workers found the hepatitis B surface Antigen (HBsAg), originally termed as *Australian antigen*[1]. The Hepatitis B virus is a blood-borne pathogen which is highly transmissible in dental and other health care settings. Hepatitis B virus infection can be prevented by vaccination. since 1981 in India approximately 3-4% of the people are infected with this virus and more than 50% of the cases are of chronic hepatitis type[2]. The HBV belongs to the family Hepadnaviridae. It consists of a partially double stranded DNA, viral proteins namely: HbCAg, HbEAg, HbSAg, and HbXAg. The HbCAg is the core protein and helps in the replication of the virus. The HbEAg is the envelope protein that is used as an index to determine the degree of infection. If the E antigen is positive, the risk of transmission is upto 30% and if it is negative, it is between 1% to 6%[2]**.** The HbSAg is the surface antigen, it is an important serological marker that appears 1- 10 weeks following an acute exposure[3]. It is essential in diagnosis to determine the presence of an HBV infection. The risk of transmission is between 37%-62%if HbSAg and HbEAg are positive and 23%-37% if the carrier is positive only for HbSAg [4].The HBV virion binds to specific receptors present on the surface of the hepatocytes, which is followed by the entry of the viral nucleocapsids into the nucleus of the liver cells where the viral genome is released . The virus affects the liver, causing acute or chronic infections- most common being Cirrhosis of the liver and Hepatocellular carcinoma. The HBV infection occurs with an average incubation period of 90 days.

## IGNORANCE OF DENTISTS

In a survey of dentists, it was found that only 31 % of the dentists were willing to treat HIV , whereas 73% dentists preferred to treat HBV patients[5] **.** Based on a study in Cameroon, it was found that there is a high rate of accidental exposure to blood and a very low HBV vaccination uptake in medical students in Cameroon, leading to a high occupational risk of HBV infection[6]. In 2002, a study among medical and nursing students in Mumbai showed that only 26.3% of the students had taken their 3 dose HBV vaccine series[7]. Hepatitis B Vaccination among Physicians, Dentists and Nurses in Bahrain revealed that hepatitis B vaccination coverage is very low[8]**.** Hepatitis-B vaccination status among dental surgeons in Benin City, Nigeria revealed low prevalence of complete hepatitis-B vaccination among the respondents[9]. Based on a study in Montes Claros, Minas Gerais, (2007-2008) to assess hepatitis B vaccination among practicing dental surgeons, it was found that 91.2% had completed their vaccination and 8.8% did not complete their vaccination, and it was stated that" lack of information" was the main reason for the dentists not being vaccinated[10].

## ROUTE OF TRANSMISSION

The HBV is present in increased concentrations in blood (primarily), serum, saliva, crevicular fluid, and wound exudates. The transmission occurs most commonly via hollow bore needles with vascular access. The dental procedures with increased chances of viral transmission include: administration of local anaesthesia, general oral surgery, extractions, periodontal surgeries, osseous implant surgeries and suturing. Exposure to HBV in dental setting may not be immediate, as HBV has been demonstrated to survive in dried blood at room temperature on environmental surfaces for atleast 1 week [11]. The occurrence of needle stick injuries in Taiwan is reported to be 1.3 per person per year and is significantly higher than in other Asian countries[12]. As for HBV, the risk of pathogen transmission with sharp objects has been estimated to be between 6% to 30%. Shah Et al reported that needles were responsible for 89% of dental prone injuries in 7 years of notification [13].

## PREVENTION

1.Treat all patients as potentially infectious.
2. Use personal protective equipment- gloves ( double gloving), masks, aprons.
3. Cautious handling of needles and other sharp instruments, during transfer of instruments, during administration of LA and recapping the needles.
4. Safe disposal of blood contaminated instruments and materials.

## IMMEDIATE MANAGEMENT

1. The surface which has been pricked or cut by the contaminated needle or the sharp instrument should be gently squeezed to encourage bleeding and washed in running tap water with soap.
2.Use of disinfectant- 1%sodium hypochlorite, or 10% iodine solution.
3. Note the date and time of exposure.
4. The body substance or fluid involved- for mucous membrane exposure: irrigation with water/saline for few minutes is advocated. Scrubbing should be avoided as it causes penetration of the virus into deeper tissues.
5. Severity of exposure should be considered.
6. Information about the **source** person- HBV status.

### *HBsAg-Positive Exposure Source*

- Persons who have written documentation of a complete hepatitis B vaccine series and who did not receive postvaccination testing should receive a single vaccine booster dose.
- Persons who are in the process of being vaccinated but who have not completed the vaccine series should receive the appropriate dose of hepatitis B immune globulin (HBIG) and should complete the vaccine series.
- Unvaccinated persons should receive both HBIG and hepatitis B vaccine as soon as possible after exposure (preferably within 24 hours). Hepatitis B vaccine may be administered simultaneously with HBIG in a separate injection site. The hepatitis B vaccine series should be completed in accordance with the age-appropriate vaccine dose and schedule.

### *Exposure Source with Unknown HBsAg Status*

- Persons with written documentation of a complete hepatitis B vaccine series require no further treatment.
- Persons who are not fully vaccinated should complete the vaccine series.
- Unvaccinated persons should receive the hepatitis B vaccine series with the first dose administered as soon as possible after exposure, preferably within 24 hours. The vaccine series should be completed in accordance with the age-appropriate dose and schedule.

7. Information about the exposed person – vaccination status , anti- HbS titre level should be checked and monitored.

### *POST EXPOSURE PROPHYLAXIS*

It should be done as early as possible (within 24 hrs). It is found to be effective in 75% to more than 90% of the people[14]. About 4% of dentists infected with HBV are also infected with HDV ( Hepatitis delta virus) since HDV is dependant on HBV for replication, so either pre/post immunization to HBV can prevent it [15]

***GUIDELINES[16]***

**TABLE 3. Recommended postexposure prophylaxis for exposure to hepatitis B virus**

| Vaccination and antibody response status of exposed workers* | Treatment | | |
|---|---|---|---|
| | Source HBsAg† positive | Source HBsAg† negative | Source unknown or not available for testing |
| **Unvaccinated** | HBIG§ x 1 and initiate HB vaccine series¶ | Initiate HB vaccine series | Initiate HB vaccine series |
| **Previously vaccinated** | | | |
| Known responder** | No treatment | No treatment | No treatment |
| Known nonresponder†† | HBIG x 1 and initiate revaccination or HBIG x 2§§ | No treatment | If known high risk source, treat as if source were HBsAg positive |
| Antibody response unknown | Test exposed person for anti-HBs¶¶ 1. If adequate,** no treatment is necessary 2. If inadequate,†† administer HBIG x 1 and vaccine booster | No treatment | Test exposed person for anti-HBs 1. If adequate,¶ no treatment is necessary 2. If inadequate,¶ administer vaccine booster and recheck titer in 1–2 months |

* Persons who have previously been infected with HBV are immune to reinfection and do not require postexposure prophylaxis.

† Hepatitis B surface antigen.

§ Hepatitis B immune globulin; dose is 0.06 mL/kg intramuscularly.

¶ Hepatitis B vaccine.

** A responder is a person with adequate levels of serum antibody to HBsAg (i.e., anti-HBs ≥10 mIU/mL).

†† A nonresponder is a person with inadequate response to vaccination (i.e., serum anti-HBs < 10 mIU/mL).

§§ The option of giving one dose of HBIG and reinitiating the vaccine series is preferred for nonresponders who have not completed a second 3-dose vaccine series. For persons who previously completed a second vaccine series but failed to respond, two doses of HBIG are preferred.

¶¶ Antibody to HBsAg.

***HBV VACCINE***

The Hepatitis B vaccine should be administered as early as possible**.** Administration of HBV vaccine within 12-24 hours of exposure has demonstrated 70% - 90% efficiency in prevention of infection[17].The vaccines available currently are obtained from recombinant DNA technology ,where a portion of the viral gene coding for HbSAg is cloned into the yeast and the vaccine for hepatitis B is produced from cultures of this recombinant yeast strain. It is administered intramuscularly in the deltoid region. The vaccination involves a 3 dose series given in 0,1,6 months respectively. Following which an antibody response is established in the bloodstream. The common brands available are Recombivax HB (Merck), Engerix-B (GSK), Elovac B (Human Biologicals Institute, a division of Indian Immunologicals Limited), Genevac B (Serum Institute), Shanvac B, etc. Long-term studies of immunized adults and children indicate that the immune memory remains intact for at least 12 years, even though the

anti-HbS levels may become low or undetectable and routine booster doses of hepatitis B vaccine are not considered necessary [18].

### *HEPATITIS B IMMUNGLOBULIN*

The administration of HBIg is an important element in the post exposure management following an exposure to the HBV. It is prepared from the plasma of donors who have increased levels of anti- hepatitis B antibodies. The obtained human sera is screened for HIV, HBV, HCV and processed . The HBIg is given through IM route, with a recommended dose of 0.06 ml/kg[19] . It can be administered along with the hepatitis B vaccine, in such a case it should be administered in a different anatomic region such as the gluteal muscles or the opposite deltoid muscle . The chance of seroconversion can be reduced by 90% with this post-exposure prophylaxis.[20]. Adverse reactions to HBIG are unusual but can include pain at the injection site and allergic reactions. It is contraindicated only in individuals who have a known history of anaphylaxis to immunoglobulins. If the individual chooses not to take HBV vaccine series following administration of HBIg , then a second dose of HbIg should be given 30 days later [21]**.** The various trade names include: Bayhep B, HepaGam B, HyperHEP B, Nabi-HB, Nabi-HB NovaPlus.

### *SEROLOGICAL ANTIBODY TESTING*

It is done to check the immune status of the individual. Pre-vaccination serologic testing is not indicated for most persons being vaccinated, except for those providers and students at increased risk for HBV infection. It should be done following the three dose vaccine series (between 1-6 months). It is mandatory to measure the antibody response for vaccinated individuals with higher risk professions [22].Anti-HbS level of 100 IU/L or more is considered protective. In a study done in Karnataka, India, 110 dental students were evaluated for their immune status 2 years after their first dose of vaccination , out of which only 40 students had undergone complete vaccination ,3 of which were low responders (ie: they showed anti- HbS level below 100IU/L)[23]. The low responders were given a second dose of vaccination followed by a serological testing[23]. It was noted that males, individuals with a history of smoking had a negative impact on the immune status (anti-HbS level below 100 IU/L)[23]. The others factors influencing the level of anti- HBS based on various studies included: Age ( the immune status declined with increased age > 35 years), Gender ( Males were more likely to be non-responders), Obesity (individuals more than 60 kg body weight were more likely to be non-responders), Smoking (level of immunization is lower in smokers)[24].

### *MANAGEMENT OF HBV CARRIERS*

There is no complete effective treatment for HBV carriers , but it was found that about 25%-50% of the carriers responded to alpha-interferon therapy, and 19% responded to lamivudine, it was also noted that some HbEAg carriers lost their' E'antigen and became less infectious [25]. The US Food and Drug Administration has approved 7 antiviral agents (interferon-a, peg interferon, lamivudine, telbivudine, adefovir, tenofovir, and entecavir) for the treatment of chronic hepatitis B in the United States; others (eg, emtricitabine and clevudine) are currently under evaluation [26].

### *WORK PRACTISE OF THE DENTIST DURING THE FOLLOW UP PERIOD*

The dentist should avoid donating blood and, he or she is not allowed to perform exposure prone procedures as seroconversion occurs within 6 months[27].

## CONCLUSION

Since the dental health care setting permits increased chances of hepatitis B transmission, it is essential that every dentist should have a good knowledge on the pathogenic nature of the hepatitis B virus, the importance of receiving the three dose HBV vaccine series prior to exposure, followed by booster doses, and take precautions to create a safe work environment, and the necessary steps in management following an accidental exposure to prevent the onset of infection.

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