International Arab Journal of Dentistry

Volume 14 | Issue 2 Article 17

2023

Dentists and Hepatitis B Vaccination – An In Vivo National Study

Ghassan Yared
Saint Joseph University

Aynaa Al Khatib
Beirut Arab University

Wassim AL MANHAL
Saint Joseph University

Nathalie Yared
Saint Joseph University

Ronald Younes
Saint Joseph University

ORIGINAL ARTICLE / *ARTICLE ORIGINAL*

Public Health / *Santé Publique*

DENTISTS AND HEPATITIS B VACCINATION – AN *IN VIVO* NATIONAL STUDY

Ghassan Yared[1] | Aynaa Al-Khatib[2] | Wassim El Manhal[3] | Nathalie Yared[4] | Ronald Younes[5]

Introduction: Hepatitis B continues to be a serious occupational concern for dental healthcare practitioners, with the possibility of transmission occurring during patient care practices. The incidence of hepatitis B amongst dentists, the factors raising their occupational risk, and the efficiency of vaccination programs in reducing this risk are all examined in this paper's methodical evaluation of the body of prior research. This study addresses the important confluence of hepatitis B infection, occupational exposure, and vaccination status amongst dentists. In addition, it provides methods for improving the protection of dental professionals against hepatitis B infection by summarizing major findings and highlighting gaps in current knowledge, assuring the safety of both healthcare workers and their patients. The main objective of the study is to assess the relationship between Hepatitis B vaccination status and immunization level as measured by anti-HBs titer among a population of 192 dentists in Lebanon.

Materials & Methods: 192 dentists, underwent the anti-HBs titer blood test. This test, which is Elecsys Anti-HBs, was used for the quantitative assessment of antibodies against the HBsAg.

Results: The chi-square test was used to assess the association between being vaccinated against Hepatitis B and being immunized against the disease. A significant association was found between vaccination and immunity status. Among those vaccinated against Hepatitis B, 86.7% were found to be immune based on the blood test results versus 36.0% of those not vaccinated ($p<0.001$).

Conclusion: the current study's It highlights how crucial it is to keep up efforts to increase vaccination rates and promote immunization in order to improve population health and well-being in general. A dentist can play a part in hepatitis prevention by treating each and every patient as a possible hepatitis carrier.

Keywords: Dentists, Hepatitis B Virus, immunization, occupational exposure, vaccination.

Corresponding author:
Ghassan Yared. E-mail: Ghassan.yared@usj.edu.lb

Conflicts of interest:
The authors declare no conflicts of interest.

1- Department of Oral Medicine and Radiology, Head of the continuing education committee, Faculty of Dental Medicine, Saint Joseph University, Beirut, Lebanon.
Email: Ghassan.yared@usj.edu.lb
2- Department of Medical Laboratory Technology, Faculty of Health Sciences, Beirut Arab University, Beirut, Lebanon. aynaa
Email: khatib@bau.edu.lb
3- Department of Oral Medicine and Radiology, Co-director of Cranio-Facial Research Laboratory, , Faculty of Dental Medicine, Saint Joseph University, Beirut, Lebanon.
Email: Wassim.manhal@usj.edu.lb
4- Department of Removable Prosthodontics, Faculty of Dental Medicine, Saint Joseph University, Beirut, Lebanon
Email: nathalie.yared@net.usj.edu.lb
5- Department of Oral Surgery, Faculty of Dental Medicine, Saint Joseph University, Beirut, Lebanon.
Email: ronald.younes@usj.edu.lb

DENTISTES ET VACCINATION HÉPATITE B – UNE ETUDE NATIONALE IN VIVO

Introduction : L'hépatite B demeure une préoccupation professionnelle sérieuse pour les praticiens de la santé dentaire, avec la possibilité de transmission pendant les soins aux patients. L'incidence de l'hépatite B parmi les dentistes, les facteurs accroissant leur risque professionnel, et l'efficacité des programmes de vaccination dans la réduction de ce risque sont tous examinés dans cette évaluation méthodique de la recherche antérieure. Cette étude aborde la confluence importante de l'infection à l'hépatite B, de l'exposition professionnelle et du statut de vaccination chez les dentistes. De plus, elle propose des méthodes pour améliorer la protection des professionnels dentaires contre l'infection à l'hépatite B en résumant les principales découvertes et en mettant en évidence les lacunes dans les connaissances actuelles, garantissant la sécurité à la fois des travailleurs de la santé et de leurs patients. L'objectif principal de l'étude est d'évaluer la relation entre le statut de vaccination contre l'hépatite B et le niveau d'immunisation mesuré par le titre d'anti-HBs parmi une population de 192 dentistes au Liban.

Matériels et méthodes : 192 dentistes ont subi le test sanguin anti-HBs. Ce test, Elecsys Anti-HBs, a été utilisé pour l'évaluation quantitative des anticorps contre l'AgHBs.

Résultats : Le test du chi carré a été utilisé pour évaluer l'association entre le fait d'être vacciné contre l'hépatite B et l'immunisation contre la maladie. Une association significative a été trouvée entre la vaccination et le statut immunitaire. Parmi les personnes vaccinées contre l'hépatite B, 86,7 % se sont révélées immunisées sur la base des résultats des analyses de sang contre 36,0 % des personnes non vaccinées ($p<0,001$).

Conclusion : l'étude actuelle souligne à quel point il est crucial de maintenir les efforts visant à augmenter les taux de vaccination et à promouvoir la vaccination afin d'améliorer la santé et le bien-être de la population en général. Un dentiste peut jouer un rôle dans la prévention de l'hépatite en traitant chaque patient comme un porteur possible de l'hépatite.

Mots clés : Dentistes, Exposition professionnelle, Immunisation, Vaccination, Virus de l'hépatite B

Introduction

Hepatitis is the medicinal scientific term for liver inflammation. It is frequently caused by a viral infection. Hepatitis viruses are classified into six categories, each denoted by a distinct letter: Hepatitis A, B, C, D, and E. [1]

The hepatitis B virus infection is a significant global health issue. It is a liver infection caused by the hepatitis B virus (HBV) that has the potential to be life-threatening. [2] More than 95% of immunocompetent persons with HBV infection can eradicate it on their own. Patients may present with acute clinical disease or with an asymptomatic infection diagnosed during HBV screening. [2] HBV infection manifests clinically differently in acute and chronic illnesses. Patients may develop subclinical or anicteric, icteric, or, less frequently, fulminant hepatitis during the acute infection. Patients with a chronic infection may have cirrhosis, hepatocellular cancer, chronic hepatitis, or an asymptomatic carrier condition. [2]

Hepatitis B Virus

Hepatitis B virus (HBV) is a tiny DNA virus with peculiar characteristics like retroviruses. It belongs to the Hepadnaviridae family and is a virus prototype. [3]a member of the Hepadnaviridae family, is a small DNA virus with unusual features similar to retroviruses. HBV replicates through an RNA intermediate and can integrate into the host genome. The unique features of the HBV replication cycle confer a distinct ability of the virus to persist in infected cells. Virological and serological assays have been developed for diagnosis of various forms of HBV-associated disease and for treatment of chronic hepatitis B infection. HBV infection leads to a wide spectrum of liver disease ranging from acute (including fulminant hepatic failure In the course of its life cycle, the 3.2 kilobase, partly double-stranded HBV virus reverse transcribes pregenomic ribonucleic acid (RNA) into DNA. [4] The genome is made up of an outer lipid envelope and an inner nucleocapsid core, which are encoded by four overlapping open reading frames known as C, X, P, and S. [4]

Acute vs. Chronic Hepatitis

Hepatitis is typically categorized as acute or chronic based on how long the liver has been inflamed and damaged. [5] Acute hepatitis is referred to be a period of inflammation or hepatocellular injury that lasts shorter than six months and is marked by normalization of the liver function tests. On the other hand, the condition is known as chronic hepatitis if the inflammation or hepatic injury lasts for longer than six months.[5]

A viral infection is the most prevalent infectious cause of acute hepatitis (acute viral hepatitis). However, acute hepatitis can be brought on by a wide range of noninfectious conditions, such as drug use (drug-induced hepatitis), alcohol use (alcoholic hepatitis), immune system conditions (autoimmune hepatitis, primary biliary cholangitis), indirect insult secondary to biliary tract dysfunction (cholestatic hepatitis), pregnancy-related liver disorders, shock, or metastatic disease. [5]

Acute HBV infection affects about two thirds of individuals with a moderate, asymptomatic disease that frequently goes unnoticed. [3]a member of the Hepadnaviridae family, is a small DNA virus with unusual features similar to retroviruses. HBV replicates through an RNA intermediate and can integrate into the host genome. The unique features of the HBV replication cycle confer a distinct ability of the virus to persist in infected cells. Virological and serological assays have been developed for diagnosis of various forms of HBV-associated disease and for treatment of chronic hepatitis B infection. HBV infection leads to a wide spectrum of liver disease ranging from acute (including fulminant hepatic failure Acute infections in adults normally resolve on their own and do not require treatment. [1] In adults with acute HBV infection, about one-third experience clinical hepatitis symptoms and signs, which can vary from moderate constitutional symptoms like fatigue and nausea to more severe ones like jaundice and, in rare cases, acute liver failure which affects about 1% of individuals with acute hepatitis B and jaundice. [3]a member of the Hepadnaviridae family, is a small DNA virus with unusual features similar to retroviruses. HBV replicates through an RNA intermediate and can integrate into the host genome. The unique features of the HBV replication cycle confer a distinct ability of the virus to persist in infected cells. Virological and serological assays have been developed for diagnosis of various forms of HBV-associated disease and for treatment of chronic hepatitis B infection. HBV infection leads to a wide spectrum of liver disease ranging from acute (including fulminant hepatic failure The average clinical incubation time for acute hepatitis B is 2-3 months, but it can take anywhere between 1-6 months following infection. The length of the incubation time is somewhat correlated with the amount of virus exposure. [3]a member of the Hepadnaviridae family, is a small DNA virus with unusual features similar to retroviruses. HBV replicates through an RNA intermediate and can integrate into the host genome. The unique features of the HBV replication cycle confer a distinct ability of the virus to persist in infected cells. Virological and serological assays have been developed for diagnosis of various forms of HBV-associated disease and for treatment of chronic hepatitis B infection. HBV infection leads to a wide spectrum of liver disease ranging from acute (including fulminant hepatic failure

During the acute phase, serum ALT levels rise, and elevated amounts of HBsAg and HBV DNA are detected. The preicteric phase might last several days to a week

and is followed by the emergence of jaundice or black urine. The icteric phase of hepatitis B lasts between 1-2 weeks and is characterized by a reduction in viral levels. Jaundice disappears after convalescence, although constitutional symptoms might remain for weeks or even months. HBsAg is eliminated during this phase, followed by the removal of measurable HBV DNA from serum. [3]a member of the Hepadnaviridae family, is a small DNA virus with unusual features similar to retroviruses. HBV replicates through an RNA intermediate and can integrate into the host genome. The unique features of the HBV replication cycle confer a distinct ability of the virus to persist in infected cells. Virological and serological assays have been developed for diagnosis of various forms of HBV-associated disease and for treatment of chronic hepatitis B infection. HBV infection leads to a wide spectrum of liver disease ranging from acute (including fulminant hepatic failure

If someone has previously had hepatitis B and recovered, it signifies that their immune system has produced antibodies that will most likely keep the infection under control. Hepatitis B viruses can reactivate in rare instances, such as when the immune system is compromised by chemotherapy. [1]

The course of chronic hepatitis B is diverse and dynamic. Early in the course of infection, high titers of HBeAg, HBsAg, and HBV DNA are often present, and serum aminotransferase levels are mildly to moderately elevated.[3]a member of the Hepadnaviridae family, is a small DNA virus with unusual features similar to retroviruses. HBV replicates through an RNA intermediate and can integrate into the host genome. The unique features of the HBV replication cycle confer a distinct ability of the virus to persist in infected cells. Virological and serological assays have been developed for diagnosis of various forms of HBV-associated disease and for treatment of chronic hepatitis B infection. HBV infection leads to a wide spectrum of liver disease ranging from acute (including fulminant hepatic failure

The severity of the condition has a direct impact on the general prognosis of chronic hepatitis patients. The five-year survival rate for people with severe cirrhosis and chronic hepatitis is around 50%. [3]a member of the Hepadnaviridae family, is a small DNA virus with unusual features similar to retroviruses. HBV replicates through an RNA intermediate and can integrate into the host genome. The unique features of the HBV replication cycle confer a distinct ability of the virus to persist in infected cells. Virological and serological assays have been developed for diagnosis of various forms of HBV-associated disease and for treatment of chronic hepatitis B infection. HBV infection leads to a wide spectrum of liver disease ranging from acute (including fulminant hepatic failure

A long-term complication of the condition, such as cirrhosis, end-stage liver disease, or Hepato-cellular carcinoma (HCC), is thought to eventually develop in one-third of people with chronic HBV infection. [3]a member of the Hepadnaviridae family, is a small DNA virus with unusual features similar to retroviruses. HBV replicates through an RNA intermediate and can integrate into the host genome. The unique features of the HBV replication cycle confer a distinct ability of the virus to persist in infected cells. Virological and serological assays have been developed for diagnosis of various forms of HBV-associated disease and for treatment of chronic hepatitis B infection. HBV infection leads to a wide spectrum of liver disease ranging from acute (including fulminant hepatic failure

A range of 0-12.1% chronicity post-acute hepatitis B infection was found in a widely referenced literature review that examined 10 studies of usually healthy persons. In light of this, less than 10% of cases of acute hepatitis B were cited to proceed to chronic hepatitis B. [6] Patients above the age of 50 had a significantly increased probability of progressing to chronicity.[6]

Symptoms

Human HBV infection can either go undetected or result in hepatitis B, an inflammatory liver disease. It's significant to note that up to 30% of affected people still don't know how they become infected. [7]

Many individuals who become sick have no symptoms or have symptoms that are unusual, and after contracting the infection, symptoms may not appear until one to six months later. Therefore, a person may have hepatitis B for a long time before a diagnosis and may unwittingly infect others during that time. [1]

Anorexia, nausea, vomiting, abdominal discomfort, and jaundice are only a few examples of the initial, non-specific symptoms. However, patients with significant severe liver damage may experience infections, coagulopathy, ascites, gastro-

intestinal bleeding due to esophageal varices, jaundice, and hepatic encephalopathy. [2]

Epidemiology and Prevalence

Because of the potential for development to a chronic condition and the associated mortality and morbidity, HBV infection poses a critical concern to global public health. [2]

The World Health Organization estimates that 240 million individuals worldwide carry the chronic form of the disease, and that 690,000 people die each year from consequences like liver cancer or cirrhosis that result from the disease's progression. [8]

Around 350–400 million people worldwide have chronic hepatitis B infection. In the United States, every year, there are about 60,000 new instances of HBV infection and at least 2 million American people have a chronic hepatitis B infection. People under the age of 12 who were born in the United States have a lower prevalence. [2] In addition, HBV infection is responsible for 5% to 10% of chronic end-stage liver disease, 10% to 15% of hepatocellular carcinoma cases, and causes 5000 fatalities each year. [2]

Areas with a high prevalence are those with a hepatitis B surface antigen (HBsAg) positivity rate of more than or equal to 8%, areas with a low to intermediate prevalence rate of 2–7%, and those with a low prevalence rate of less than 2%. [2]

Transmission of Hepatitis B

Horizontal Transmission:

Occurs when mucosal surfaces or sexual intercourse are in contact. In places with low to moderate prevalence, unprotected intercourse and injectable drug use are the main methods of transmission. [2]

Sexual contact refers to unprotected intercourse (vaginal, oral, or anal), whereas mucosal contact refers to any contact with an infected patient's saliva, vaginal fluid, sperm, or blood.[2]

Vertical Transmission:

Perinatal viral transmission from the mother to the infant is referred to as vertical transmission. In high-prevalence areas, it is the primary method of transmission. [2]

Occupational Exposure Risk

Healthcare workers are four times more likely to get hepatitis B than the overall adult population, including those who do not work in medical facilities. [9] Serologic indicators of past or current clinical or subclinical hepatitis B infection are more common in some categories of healthcare professionals than in the general population. [10] roughly three times the prevalence in the general population. Frequent contact with blood and body secretions of potentially infectious patients undoubtedly is a major factor in the increased seroprevalence and risk of hepatitis B. The potential sequelae of HBV infection include chronic active hepatitis, cirrhosis, primary hepatocellular carcinoma, and development of the chronic carrier state, any of which may have a devastating impect on the personal health and professional career of the emergency physician. A vaccine against hepatitis B has been available since 1982 and has been found to be effective in approximately 90% of vaccinees. The vaccine is generally well tolerated; the most common side effects are reactions at the injection site, although systemic side effects may occur. The risk of serious illness due to the vaccine is very low. Using a risk/benefit analysis to assess the risks of hepatitis B and the risks and benefits of HBV vaccination, it is clear that HBV vaccination should be accepted by the emergency physician to minimize the risk of contracting hepatitis B.","container-title":"The American Journal of Emergency Medicine","-DOI":"10.1016/0735-6757(87

It was shown that dental and oral surgeons had the highest rates of HBV infection among all healthcare workers, and that their infection rates were three to four times higher than those of the general population, according to studies among healthcare workers held in the late 1970s and early 1980s after the development of hepatitis B serologic tests. [11] According to studies, the prevalence is 24% among oral surgeons, 17% among dental hygienists, and 16% among general dentists. [10]roughly three times the prevalence in the general population. Frequent contact with blood and body secretions of potentially infectious patients undoubtedly is a major factor in the increased seroprevalence and risk of hepatitis B. The potential sequelae of HBV infection include chronic active hepatitis, cirrhosis, primary hepatocellular carcinoma, and development of the chronic carrier state, any of which may have a devastating impect on the personal health and professional career of the emergency physician. A vaccine against hepatitis B has been available since 1982 and has been found to be effective in approximately 90% of vaccinees. The vaccine is generally well tolerated; the most common side effects are reactions at the injection site, although systemic side effects may occur. The risk of serious illness due to the vaccine is very low. Using a risk/benefit analysis to assess the risks of hepatitis B and the risks and benefits of HBV vaccination, it is clear that HBV vaccination should be accepted by the emergency physician to minimize the risk of contracting hepatitis B.","container-title":"The American Journal of Emergency Medicine","-DOI":"10.1016/0735-6757(87

Occupational exposure is regarded as one of the main risk factors for HBV transmission out of all the acknowledged transmission routes. Given the circumstances, dentists are at a significant risk of exposure and contamination in their clinical practice setting. [8] Due to their regular exposure to blood and bodily fluids during dental procedures, dentists and dental surgeons have an elevated susceptibility to acquiring bloodborne infections like hep-

atitis B. [11] Dentists routinely have contact with patients in enclosed environments where aerosols from handpieces and ultrasonic scalers are created. Furthermore, their use of sharp equipment increases the risk of exposure to bloodborne pathogens. [12]

Although there is a possibility that dentists can spread infections to their patients, the risk is higher the other way around where dentists are more likely to acquire infections from their patients. [12] It is generally known that infected surgeons who undertake exposure-risky procedures can spread hepatitis B. During a procedure, there is a 0.224% chance that an infected surgeon would transmit hepatitis B to a patient. However, issues with assessing genuine risk have been examined, and different rates between 1 per 1000 patients operated upon and a 10% transmission rate have been calculated under the assumption that 1% of surgeons are infected. [13] However, no cases of HBV transfer from a dentist to a patient have been documented since 1987. These positive outcomes have mostly been attributable to the dental staff's strong compliance with HBV immunization, rather than just their acceptance of the conventional and transmission-based measures. [14]such as Hepatitis B, Influenza and Varicella. However, excluding Hepatitis B vaccine, immunization programs for DHCPs are few and often unclear about which vaccinations are recommended, thus leading to generally low awareness and consequent low vaccination rates. This survey investigated dentists' awareness toward VPIDs. At the moment of registration to a dental congress, a questionnaire regarding the immunization status toward VPIDs was anonymously filled in by 379 Italian dentists (86% of the contacted dentists

As a result, dentists should be knowledgeable and vigilant about the necessary precautions and preventive measures for this disease. [8]

Workplace Practice Controls

The measures listed below are a significant addition to preventing blood exposures:

- Using a mechanical device to hold the needle cap to enable one-handed recapping, a one-handed scoop technique, or an engineered sharp injury prevention device (such as needles with re-sheathing mechanisms) for recapping needles between uses and prior to disposal.
- Avoiding the act of breaking or deforming needles before disposal.
- Taking out burs before removing the dental unit's handpiece.
- Grasping needles, retracting tissue, and loading/unloading scalpels with special instruments rather than fingers.
- Putting discarded disposable needles, syringes, scalpels, and other sharp objects in puncture-resistant containers that are as close as possible to where the objects were used. [15]

Post-Exposure Prophylaxis

The World Health Organization's Post-Exposure Prophylaxis (PEP) recommendation is for the prevention of infection when there is a chance of coming into contact with potentially dangerous materials. To reduce the risk of infection, the World Health Organization issued guidelines for preventing infection from hepatotropic viruses and HIV. [15]

PEP's mandatory implementation protocol consists of the six steps listed below:

1) Step One: Treatment of the Exposed Site

The site exposed to potential infectious fluid should be disinfected as quickly as possible with soap and water, while exposed mucosal membranes should be rinsed with water only. If there has been contact with the eyes, they should be cleansed with water and saline solution. Caustics should not be used, and antiseptics and disinfectants should not be applied to clean the wound. [15]

2) Step Two: Documentation and Reporting

Any case of occupational exposure needs to be notified right away. The time and date of exposure, details of the accident (where and how the exposure happened, what site or sites of exposure on the body, and, if the exposure was related to a sharps, type and brand of sharp), details of the exposure incident (type and quantity of fluid or substance a person was exposed to), the extent of injury, and information about the source of infectious material should all be included in the documentation. [15]

The following criteria must be checked:

- Has the source of the potentially contagious material been infected with HBV, HCV, or HIV?
- The stage of the disease or the quantity of infectious particles in bloodstream should be assessed if the source of infection, is HIV positive.
- Consider the past use of antiretroviral medication or antiretroviral resistance.
- Consider the exposed person's information (HBV vaccination status, reaction to immunization, other medical problems, drugs taken, and whether she was pregnant or breastfeeding). [15]

3) Step Three: Assessment of Exposure

Based on the nature of infectious material, the site from where it entered into the exposed person's body, and the degree of exposure, it is important to assess the risk of transmitting HBV, HCV, or HIV infections. Significant exposure necessitates further examination of other body fluids because it raises

the possibility of continued disease transmission through blood. [15]

4) Step Four: Inspection of Sources

- Anti-HBsAg, HCV, and HIV antibodies should be tested on the patient.
- It is not advised to evaluate "viral load".
- Rapid HIV testing should be performed on the patient. [15]

After the initial screening of the exposed individual, continued control monitoring is not necessary if the patient DOES NOT have either of these viruses. [15]

If the patient source is unknown, the likelihood (the number of sick individuals in the neighborhood, whether or not the clinic where the exposure took place treats a large number of infected or at-risk individuals) and level of risk of exposure must be assessed. [15]

5) Step Five: Specific Prophylaxis

After each encounter to potentially infectious fluids, all exposed individuals should get initial HBV, HCV, and HIV testing. The exposed person should undergo antiviral treatment rather than prevention if they have a history of infection caused by any of those viruses but were unaware of it. [15]

6) Step Six: Controlled Observation

If any of the medical personnel was exposed to hepatitis, HBV control testing, including mandatory counseling, would be required considering the following:

- Testing for anti-HBs antibodies should be conducted 1-2 months following the last dose of the vaccine.
- Advising the exposed individual to refrain from risky activity, including risky blood, plasma, organ, tissue, and sperm donation.
- Providing the necessary psychological help. [15]

Hepatitis B Vaccination

Another critically important preventive measure for hepatitis B is the vaccination against it. The most efficient method for lowering the incidence of hepatitis B worldwide is vaccination, which has been possible for more than 20 years. The WHO recommends that all children worldwide receive hepatitis B vaccine as part of their regular immunization schedule. HBsAg particles from the plasma of asymptomatic HBV carriers were isolated and inactivated to create the first generation of vaccinations. Development of DNA recombinant vaccines has been facilitated by knowledge of the structure and genetic organization of HBV. [7]

The FDA granted the first hepatitis B vaccine permission for use in the United States in 1981, and the recombinant vaccine that eventually replaced the blood-derived original hit the market in 1986. With a strong focus on eradicating the infection and greatly lowering the morbidity and death it causes, the hepatitis B vaccination program underwent significant transformation in the United States in 1991. The United States began a policy in 1991 to attain universal baby hepatitis B vaccination commencing at birth. [16]

The vaccine should be given intramuscularly in three doses at 0 months, 1 months, and 6 months. In 90% to 95% of cases, immunization can be obtained once the recommended vaccination schedule has been followed. It's crucial to check for anti-HBs antibodies in the body 30 days following the third dose to ensure the emergence of immunity. [8]

The first two doses of the initial three-dose course of immunization (0, 1, 6-month schedule) is typically adequate to start the production of anti-HBs and to prepare the immune system for a subsequent response to antigen. This secondary reaction is triggered by the third dose; anti-HBs titers are larger than those attained after the first two doses, and antibody is detected in the blood more quickly. [17]

Although a level above 10 mIU/mL tends to be defensive, several countries have adopted higher reference levels (for example, 100 mIU/mL in the UK) due to the possibility that low anti-HBs levels could conceal severe infection (indicated by HBsAg). The peak anti-HBs reaction of the individual receiving the vaccine and anti-HBs persistence are strongly correlated. During the first several years following immunization, antibody concentrations fall more quickly than they do subsequently. [17]

Vaccination has mainly proven to be successful as it benefits the entire community including those who are already immunized. It has been demonstrated that raising vaccination rates lowers virus-related morbidity and mortality, where adults' rates of acute hepatitis B infection decreased by 50% between 2000 and 2014. The herd immunity effect was primarily responsible for this outcome. [16] According to estimates, the introduction of standard hepatitis B vaccination and advancements in medical procedures led to a decrease in HBV infections among HCWs in the USA from 17,000 in 1983 to 263 in 2010. [18]

Widespread HBV vaccination among dental healthcare professionals reduced both workplace risk and patient cross-infection risk simultaneously. [14]such as Hepatitis B, Influenza and Varicella. However, excluding Hepatitis B vaccine, immunization programs for DHCPs are few and often unclear about which vaccinations are recommended, thus leading to generally low awareness and consequent low vaccination rates. This survey investigated dentists' awareness toward VPIDs. At the moment of registration to a dental congress, a questionnaire regarding the immunization status toward VPIDs was anonymously filled in by 379 Italian dentists (86% of the contacted dentists

In high-income nations, immunization against HBV is advised for all

HCWs, regardless of their specialty. [17]

All general practitioners and dental office employees are now advised by the Department of Health to receive immunizations against a number of preventable occupationally acquired illnesses, such as hepatitis B. [19] The American Dental Association and the Centers for Disease Control and Prevention both urged that health care workers, particularly dentists, with occupational exposure to blood or other body fluids receive the hepatitis B vaccine after it became commercially available in 1982. [11] However, only few infection control regulations for dentistry have recommended an immunization program. Furthermore, with the exception of the hepatitis B vaccine, which is universally and vigorously recommended, a few of these regulations did not specify which immunizations are recommended and why. [14]such as Hepatitis B, Influenza and Varicella. However, excluding Hepatitis B vaccine, immunization programs for DHCPs are few and often unclear about which vaccinations are recommended, thus leading to generally low awareness and consequent low vaccination rates. This survey investigated dentists' awareness toward VPIDs. At the moment of registration to a dental congress, a questionnaire regarding the immunization status toward VPIDs was anonymously filled in by 379 Italian dentists (86% of the contacted dentists

Hepatitis B vaccination should be conducted during the initial professional training of the oral health care practitioner or student because they are thought to be the most susceptible to contracting hepatitis B at that period. Or if for some reason, vaccination wasn't applicable at that time, all oral health care professionals should be given the option to acquire the vaccination at the beginning of their employment. [12]

For oral health care professionals, it is advised that they undergo routine post-vaccination blood tests to check for a sufficient antibody response to the hepatitis B virus. For doctors who were older than 30 at the time of vaccination or who had other diseases that can impair the immune system's capacity to produce an antibody response, testing for circulating antibodies is also advised. [12]

But because 30–50% of people lose their detectable levels of antibody within 7 years of vaccination, serological results of HBsAb understate the true number of protected workers. [20] Despite the strength of this first reaction, the level of immunity decreases three to four times every year after vaccination. The immunological response to the hepatitis B vaccine is influenced by both host and immunization variables, which can then alter the length of immunity. [21].

Immunological memory appears to last, which is ample proof that the amnestic reaction will shield workers from getting infected. Despite engaging in high-risk behavior, follow-up studies of people who received the hepatitis B vaccine have indicated that there are minimal rates of infection that develops unintentionally. [13] However, it is important to note that "loss of detectable titers does not necessarily indicate that a person is not immune," according to the Centers for Disease Control and Prevention. [20]

Since 95% of the individuals are protected following the delivery of the three recommended doses, it is still unclear whether booster doses are necessary. [22]

A "booster" vaccination is one that is administered after a primary series with the goal of improving and strengthening immunity and protecting against serious breakthrough infections. For 3-5 days following booster immunization, anti-HBs titres rapidly increase. [17]

Immunocompetent individuals for example, are not required to take boosters but in other cases like healthcare workers who are in constant occupational exposure to HBV, or immunocompetent individuals, the scenario differs. Where for HCWs at high risk of blood exposure, testing for antibodies against HBV surface antigen (HBs) is advised 1-2 months after the third dose to assess the effectiveness of the vaccination. After the 3-dose series, re-vaccination with at least 1 dose of the HBV vaccine should be taken into consideration. [18]

Whereas for immunocompromised patients, regular testing is essential, and boosters should be delivered if anti-HB titres fall below 10 mIU/ml. [22] Because booster doses are important in maintaining protective immunity and this was highlighted in a study where 34 vaccinated HCWs had gotten a booster dose; those who had done so within the previous year had mean anti-HBs levels of 1742.7 mIU/mL as opposed to 629.2 mIU/mL in those who had done so more than a year earlier ($P = 0.002$). [23]

It is challenging to comment on the rate of anti-HBs titer degradation. Therefore, it is crucial to regularly assess the anti-HBs titer in HCWs every five years after receiving an HBV vaccination. [23]

HBV Vaccination: Knowledge and Practice

According to a cross-sectional analytic study conducted in the health district of Bamenda, Cameroon, the HCW exhibited good attitudes (85.8%) and necessary knowledge (62.6%) regarding vaccination against HBV. [24] But regarding the required minimum doses for HBV immunization, only 53.8% of HCWs were aware of this information. [24] In terms of dental surgeons' understanding, there are knowledge gaps in basic hepatitis B concerns, modes of transmission, and disease control in the dental clinic setting.[25]

Regarding the vaccination rates, in a study conducted in Dr Sampurnanand Medical College, it was shown that the vaccination rates were 92.4% among doctors, 62.4% among medical students, 41.7% among nursing professionals, 24.2% among laboratory tech-

nicians, and 12.1% among nursing students. [23]

Despite the availability and recommendations for hepatitis B immunization, the vaccination rate among dental practitioners in underdeveloped nations has remained continuously low.[15] According to one survey, just 20% of dental surgeons in Benin City, Nigeria, have got three doses of hepatitis B vaccine. Another study of Brazilian dentists found that 73.8% of them had received three doses of the hepatitis B vaccine. [15] One of the first studies done on dentists in the Public Health System, Brazil, discovered that 35.6% of dentists were not immunized against HBV, drawing a distinction between self-care carelessness and professional susceptibility. [25] 11.5% of dental professionals in Iran were unvaccinated against HBV, compared to estimates of 27.02% in Spain, 17% in Italy, 12% in the Netherlands, and 7.1% in the USA. [25]

Contraindications for HBV Vaccination

Clinical trials and post-approval follow-up have both demonstrated the safety of HBV vaccinations. [22] The most usually reported side events are restricted to discomfort and swelling at the injection site, as well as fever and moderate systemic reactions such as fever, irritability, poor appetite, diarrhea, and vomiting, which typically last 1 to 2 days. [22]

The literature has plenty of evidence supporting the efficacy and safety of vaccines. However, the hepatitis B vaccine has come under criticism because of an increase in MS cases after mass vaccination in France. Several research have been undertaken since then to examine potential relationships. [26] According to a theory put forth in Neurology, the vaccine triggers an acute autoimmune reaction in those who are vulnerable, maybe as a result of molecular similarity between one of the hepatitis B surface proteins and a homologous protein in the human central nervous system. [27] Where a study comparing the amino acid sequences of hepatitis B vaccination and myelin discovered common homologies between myelin basic protein, myelin oligodendrocyte glycoprotein, and hepatitis B surface antigen. [26]

In British Columbia, where over 260,000 adolescents received the hepatitis B vaccine between 1992 and 1998, a study of the school-based hepatitis B vaccination program was sparked by the public outrage and French government response to concerns over the hepatitis B vaccine. There was no discernible variation in the number of reported cases when the prevalence of multiple sclerosis was contrasted to the prior pre-vaccination era. [27]

In a similar vein, no increase in demyelinating illness was seen following hepatitis B vaccination in a retrospective cohort research involving 135,000 participants who were part of a US healthcare data base. [27]

In a study conducted in France (Mikaeloff, 2007) between 1994 and 2003, kids with MS were contrasted with kids without the disease. The prevention of hepatitis B by vaccination was not linked to the emergence of MS in children, according to the study. Hepatitis B vaccination and MS were also examined in other studies undertaken in the US (Ascherio and colleagues, 2001), and Europe (Confavreaux, 2001) but no correlation between the two conditions was discovered. [28]

Hepatitis B vaccination has been given to hundreds of millions of individuals without causing any of them to acquire MS or any other autoimmune illness. Due to the widespread use of immunizations around the world, surveillance systems that keep track of health issues following vaccination do expect to get reports of MS arising after vaccination that arise due to pure chance. [28]

The aim of the present study is to measure the anti-HBs titer levels in a group of 192 dentists and then evaluate the relation between immunity and vaccination status.

Materials & Methods

192 healthy dentists (100 males and 92 females), underwent the anti-HBs titer blood test.

As showed in table 1, 86.9% reported being vaccinated against Hepatitis B (n=166) and 80.0% (n=153) exhibited an anti-HBs titer ≥10 mIU/mL, indicating immunity against hepatitis B.

The blood test was made by an experimented laboratory chief and tested in the laboratory of Lebanese Hospital Geitaoui-UMC, Achrafieh, Beirut, Lebanon, under the supervision of the director of the laboratory. This test, which is Elecsys Anti-HBs, was used for the quantitative assessment of antibodies against the HBsAg (hepatitis B surface antigen).

The test results were sent by SMS 48 hours after the examination date to the dentist.

Results

The statistical analysis was performed using IBM SPSS statistics version 25.0.

A descriptive analysis was first carried out. Qualitative variables are presented by their frequencies and percentages.

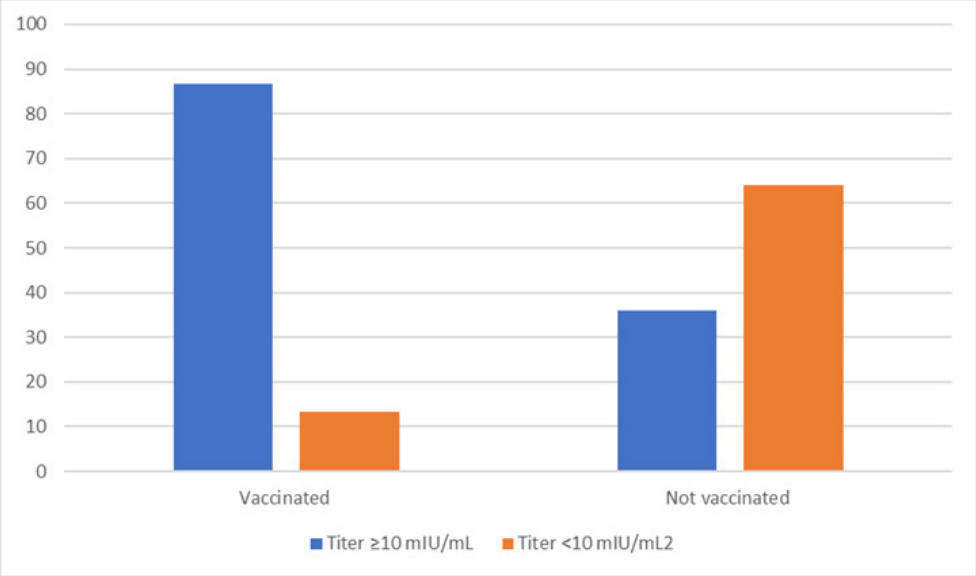
The chi-square test was used to assess the association between being vaccinated against Hepatitis B and being immunized (anti-HBs titer ≥10 mIU/mL) against the disease. A p-value of less than 0.05 was considered statistically significant.

Furthermore, a significant association was found between vaccination and immunity status. Among those vaccinated against Hepatitis B, 86.7% were found to be immune based on the blood test results versus 36.0% of those not vaccinated ($p<0.001$) as presented in Figure 1.

Discussion

The results of the present study have major consequences on public health emphasizing the efficacy of Hepatitis B immunization regimens.

Table 1. Presence of immunity against hepatitis B per vaccination status (n=192).



The findings clearly show that being vaccinated against Hepatitis B strengthens the probability of being immune against the virus which is consistent with previous research on the efficacy of Hepatitis B vaccinations. [4,6,7]

86.9% reported being vaccinated against Hepatitis B (n=166) and 80.0% (n=153) exhibited an anti-HBs titer ≥10 mIU/mL, indicating immunity against hepatitis B.

The reported vaccination ratio of 86.0 % reported in the current study is acceptable, when compared to the vaccination rates reported in other studies in various countries; in a study conducted in India (Dr Sampurnanand Medical College), it was shown that the vaccination rates were 92.4% among doctors, 62.4% among medical students, 41.7% among nursing professionals, 24.2% among laboratory technicians, and 12.1% among nursing students. [23]

Despite the availability and recommendations for hepatitis B immunization, the vaccination rate among dental practitioners in underdeveloped nations has remained continuously low.[15] According to one survey, just 20% of dental surgeons in Benin City, Nigeria, have got three doses of hepatitis B vaccine. Another study of Brazilian dentists found that 73.8% of them had received three doses of the hepatitis B vaccine. [15] One of the first studies done on dentists in the Public Health System, Brazil, discovered that 35.6% of dentists were not immunized against HBV, drawing a distinction between self-care carelessness and professional susceptibility. [25] 11.5% of dental professionals in Iran were unvaccinated against HBV, compared to estimates of 27.02% in Spain, 17% in Italy, 12% in the Netherlands, and 7.1% in the USA. [25]

According to studies on vaccine effectiveness, immunocompetent children, and adults whose post-vaccination anti-HBs concentrations reached 10 mIU/mL or higher were completely protected against acute illness and chronic infection for decades (up to 30 years have been documented), even if their anti-HBs concentrations eventually fell below 10 mIU/mL. [29]

In addition to being protective for the vaccinated individuals, the high rate of immunity (86.7%) among those who had vaccinations reinforces the idea of herd immunity. Herd immunity arises when a significant percentage of the population develops immunity to a disease, decreasing the overall rate of virus transmission throughout the community. This provides protection for people who, for medical reasons, cannot receive a vaccination, such as those with weakened immune systems. This highlights the significance of immunization efforts in attaining immunity to Hepatitis B at the population level.

Although the outcomes seem encouraging, it's crucial to keep in mind that not everyone who receives a vaccination develops immunity. For such, additional testing or booster doses could be necessary to guarantee long-term protection. Public health initiatives to eradicate Hepatitis B also continue to face hurdles in overcoming vaccination reluctance and guaranteeing universal access to vaccines.

Conclusion

In conclusion, the current study's strong evidence supporting vaccination programs targeted at preventing Hepatitis B derives from the considerable connection between immune status and Hepatitis B vaccination. It highlights how crucial it is to keep up efforts to increase vaccination rates and promote immunization in order to improve population health and well-being in general.

Simply commemorating World Hepatitis Day on July 28 is insuffi-

cient to raise community awareness. It is crucial that the media work with gastroenterologists, hepatologists, general and dental surgeons, and infectious disease institutes to produce a vast amount of public informational and educational resources. [15]

A dentist can play a part in hepatitis prevention by treating each and every patient as a possible hepatitis carrier. To lower the risk of infection, proper sterilization and infection control procedures should be followed. [15]

Efforts should be united towards enforcing a mandatory Hepatitis B Vaccination Program among dentists, dental surgeons, dental students, and even all assistants who work in dental clinics. And maybe the action of taking the vaccine and checking up protective titer levels every while can be imposed by making these things a requirement for the membership, affiliation, and affiliation renewal with the Dental Association.

References

1. "Hepatitis B: Overview," in *InformedHealth.org [Internet]*, Institute for Quality and Efficiency in Health Care (IQWiG), 2019. Accessed: Aug. 13, 2023. [Online]. Available: https://www.ncbi.nlm.nih.gov/books/NBK541967/
2. N. Tripathi and O. Y. Mousa, "Hepatitis B," in *StatPearls*, Treasure Island (FL): StatPearls Publishing, 2022. Accessed: Mar. 12, 2023. [Online]. Available: http://www.ncbi.nlm.nih.gov/books/NBK555945/
3. T. J. Liang, "Hepatitis B: The Virus and Disease," *Hepatol. Baltim. Md*, vol. 49, no. 5 Suppl, pp. S13–S21, May 2009, doi: 10.1002/hep.22881.
4. M. Guvenir and A. Arikan, "Hepatitis B Virus: From Diagnosis to Treatment," *Pol. J. Microbiol.*, vol. 69, no. 4, p. 391, Dec. 2020, doi: 10.33073/pjm-2020-044.
5. T. J. Schaefer and S. John, "Acute Hepatitis," in *StatPearls*, Treasure Island (FL): StatPearls Publishing, 2023. Accessed: Aug. 13, 2023. [Online]. Available: http://www.ncbi.nlm.nih.gov/books/NBK551570/
6. C. McKeating *et al.*, "Progression from acute to chronic hepatitis B is more common in older adults," *Ulster Med. J.*, vol. 87, no. 3, pp. 177–180, Oct. 2018.
7. M.-L. Michel and P. Tiollais, "Hepatitis B vaccines: Protective efficacy and therapeutic potential," *Pathol. Biol.*, vol. 58, no. 4, pp. 288–295, Aug. 2010, doi: 10.1016/j.patbio.2010.01.006.
8. C. A. S. Garbin, K. L. T. Vanzo, S. A. S. Moimaz, A. J. Í. Garbin, and F. Y. Chiba, "Vaccination coverage and immunity against hepatitis B in public health dentists," *Rev. Soc. Bras. Med. Trop.*, vol. 52, p. e20180534, Jun. 2019, doi: 10.1590/0037-8682-0534-2018.
9. L. A. S. Ciorlia and D. M. T. Zanetta, "Hepatitis B in healthcare workers: prevalence, vaccination and relation to occupational factors," *Braz. J. Infect. Dis.*, vol. 9, pp. 384–389, Oct. 2005, doi: 10.1590/S1413-86702005000500005.
10. K. V. Iserson, E. A. Criss, and A. L. Wright, "Hepatitis B and vaccination in emergency physicians," *Am. J. Emerg. Med.*, vol. 5, no. 3, pp. 227–231, May 1987, doi: 10.1016/0735-6757(87)90327-5.
11. J. L. Cleveland, "HEPATITIS B VACCINATION AND INFECTION AMONG U.S. DENTISTS, 1983-1992," *J. Am. Dent. Assoc.*, vol. 127, no. 9, pp. 1385–1390, Sep. 1996, doi: 10.14219/jada.archive.1996.0457.
12. P. Quaranta, "Immunizations and oral health care providers," *Dent. Clin. North Am.*, vol. 47, no. 4, pp. 641–664, Oct. 2003, doi: 10.1016/S0011-8532(03)00042-9.
13. E. Murphy, "Hepatitis B, Vaccination and Healthcare Workers," *Occup. Med.*, vol. 50, no. 6, pp. 383–386, Aug. 2000, doi: 10.1093/occmed/50.6.383.
14. S. Petti, G. A. Messano, and A. Polimeni, "Dentists' awareness toward vaccine preventable diseases," *Vaccine*, vol. 29, no. 45, pp. 8108–8112, Oct. 2011, doi: 10.1016/j.vaccine.2011.08.034.
15. P. Dahiya, R. Kamal, V. Sharma, and S. Kaur, "'Hepatitis' – Prevention and management in dental practice," *J. Educ. Health Promot.*, vol. 4, 2015, doi: 10.4103/2277-9531.157188.
16. A. Hodgens and R. Marathi, "Hepatitis B Vaccine," in *StatPearls*, Treasure Island (FL): StatPearls Publishing, 2023. Accessed: Jun. 04, 2023. [Online]. Available: http://www.ncbi.nlm.nih.gov/books/NBK554400/
17. "Are booster immunisations needed for lifelong hepatitis B immunity?," *The Lancet*, vol. 355, no. 9203, pp. 561–565, Feb. 2000, doi: 10.1016/S0140-6736(99)07239-6.
18. S. Haviari, T. Bénet, M. Saadatian-Elahi, P. André, P. Loulergue, and P. Vanhems, "Vaccination of healthcare workers: A review," *Hum. Vaccines Immunother.*, vol. 11, no. 11, pp. 2522–2537, Aug. 2015, doi: 10.1080/21645515.2015.1082014.
19. A. Rhodes, T.-C. Aw, C. Allen, and M. Ridout, "Immunisation status of dental practice staff in Kent," *Br. Dent. J.*, vol. 205, no. 10, Art. no. 10, Nov. 2008, doi: 10.1038/sj.bdj.2008.999.
20. R. Durlach, S. Laugas, C. B. Freuler, V. E. Rodríguez, and M. Costa, "Ten-Year Persistence of Antibody to Hepatitis B Surface Antigen in Healthcare Workers Vaccinated Against Hepatitis B Virus, and Response to Booster Vaccination," *Infect. Control Hosp. Epidemiol.*, vol. 24, no. 10, pp. 773–776, Oct. 2003, doi: 10.1086/502132.
21. F. B. Hollinger, "Factors influencing the immune response to hepatitis B vaccine, booster dose guidelines, and vaccine protocol recommendations," *Am. J. Med.*, vol. 87, no. 3, pp. S36–S40, Sep. 1989, doi: 10.1016/0002-9343(89)90530-5.
22. A. Kramvis, I. N. Mammas, and D. A. Spandidos, "Exploring the optimal vaccination strategy against hepatitis B virus in childhood (Review)," *Biomed. Rep.*, vol. 19, no. 1, Jul. 2023, doi: 10.3892/br.2023.1631.
23. V. Batra, A. Goswami, S. Dadhich, D. Kothari, and N. Bhargava, "Hepatitis B immunization in healthcare workers," *Ann. Gastroenterol. Q. Publ. Hell. Soc. Gastroenterol.*, vol. 28, no. 2, pp. 276–280, 2015.

24. A. M. Ngum *et al.*, "Vaccination against Hepatitis B among health care workers in the Bamenda Health District: influence of knowledge and attitudes, Cameroon," *Pan Afr. Med. J.*, vol. 40, no. 216, Art. no. 216, Dec. 2021, doi: 10.11604/pamj.2021.40.216.16856.

25. C. A. S. Garbin, B. Wakayama, T. A. Saliba, J. Orlando Adas Saliba, and A. J. Í. Garbin, "A cross-sectional study on dental surgeons' immune status against hepatitis B virus in the Public Health System," *Rev. Inst. Med. Trop. São Paulo*, vol. 62, 2020, doi: 10.1590/S1678-9946202062018.

26. K. Luhadia, M. Abugrin, R. Kiani, A. Ahmady, J. Virk, and K. Yashi, "Hepatitis B Vaccine and Multiple Sclerosis: Cause or Coincidence," *Cureus*, vol. 14, no. 10, p. e29941, doi: 10.7759/cureus.29941.

27. S. D. Zucker, "The hepatitis B vaccine: Sorting through the B.S. about M.S," *Gastroenterology*, vol. 120, no. 7, pp. 1880–1882, Jun. 2001, doi: 10.1053/S0016-5085(01)70202-8.

28. "Hep B Vaccine and Multiple Sclerosis FAQs | Vaccine Safety | CDC." Accessed: Aug. 27, 2023. [Online]. Available: https://www.cdc.gov/vaccinesafety/concerns/history/hepb-faqs.html

29]. J. Pattyn, G. Hendrickx, A. Vorsters, and P. Van Damme, "Hepatitis B Vaccines," J. Infect. Dis., vol. 224, no. Suppl 4, pp. S343–S351, Sep. 2021, doi: 10.1093/infdis/jiaa668.