

The Prevalence of Hepatitis B Viral Markers in Anesthesia Personnel

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The prevalence of hepatitis B viral markers is increased in some groups of medical workers who are exposed to blood from patients carrying the virus, but this has not been studied critically in physicians and others who administer anesthesia. Physician anesthesiologists (M.D.) and nurse anesthetists and anesthesia assistants (non-M.D.) at four university-affiliated hospitals were evaluated for hepatitis B markers as determined by seropositivity for hepatitis B surface antigen, antibody to the hepatitis B surface antigen, or antibody to the hepatitis B core antigen. In the 86 subjects (38 M.D., 48 non-M.D.) who represented 80.4% of possible participants, the overall prevalence of serologic markers of hepatitis B was 23.3%. The frequency did not differ between M.D. (23.7%) and non-M.D. (22.9%) groups or between men (20.3%) and women (26.9%). Of 81 subjects who had no clinical history of hepatitis, 16 (19.8%) had positive serologic markers. The frequency of seropositivity increased with time since graduation from medical school (M.D.) or nursing school or college (non-M.D.). The prevalence of serologic markers of hepatitis B virus in this study of anesthesia personnel is five to eight times that of the general population but is similar to that of other medical workers who frequently are exposed to blood. (Key words: Anesthesiologists; occupational hazards. Infection: Hepatitis B. Liver: Hepatitis B.)

MANY GROUPS of health care workers have a high risk of becoming infected with hepatitis B virus because of repeated handling of blood or body fluids from infectious carriers.^{1,2} The initial hepatitis B infection may not be clinically apparent, so that many cases in hospital personnel go undetected. Accurate determination of the prevalence of hepatitis B requires testing for serologic markers of current or prior infection. Anesthesiologists and other individuals administering anesthesia frequently handle blood samples or body fluids that may transmit the hepatitis B virus. Denes *et al.* surveyed 10.6% of physicians attending three national meetings for serologic evidence of hepatitis B infection.² By grouping the participants by medical specialty, he demonstrated that 17% of the 59 anesthesiologists who participated had hepatitis B surface antibodies.

After infection with hepatitis B virus, 6-10% of adults become chronic carriers of the virus. About one-fourth

of carriers develop chronic active hepatitis that may progress to cirrhosis. There is now evidence that the hepatitis B virus is related to the pathogenesis of hepatocellular carcinoma.^{3,4} Although there is no treatment for these diseases, a vaccine to immunize against hepatitis B has been developed and tested and is recommended for high-risk groups.⁵⁻⁷ To determine the prevalence of hepatitis B infection and the possible need for vaccination of individuals who administer anesthesia, we screened blood samples from anesthesiologists and other individuals who administer anesthesia at four university-affiliated hospitals.

Methods

After receiving approval from the University Human Research Committee and obtaining informed consent, blood samples were taken from physician anesthesiologists (M.D.) and nurse anesthetists and anesthesia assistants (non-M.D.) who actively were involved with patient care at the four major hospitals affiliated with Emory University Department of Anesthesiology. These facilities include a 600-bed adult referral center, a 940-bed county supported hospital, a 130-bed pediatric referral hospital, and a 500-bed Veterans Administration Medical Center. The participants completed a questionnaire to obtain personal historic data and specific characteristics of their anesthetic practice. Although all personnel in the department were asked to take part in the study, participation was voluntary, and confidentiality was guaranteed by using only numbers on blood samples, questionnaires, and data sheets.

Serum from the blood samples was tested for hepatitis B surface antigen (HBsAg), surface antibody (anti-HBs), and core antibody (anti-HBc) by radioimmunoassay (Abbott Laboratories, North Chicago, Illinois).§

Pearson chi-square, Yates corrected chi-square, or Fisher exact test were used for statistical analysis of the data. *P* values are given where appropriate and a *P* value of <0.05 was taken as indicative of statistical significance.

Results

Eighty-six (38 M.D., 48 non-M.D.) of 107 possible subjects (80.4%) at the four hospitals were studied. The overall prevalence of one or more positive serologic

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Received from the Department of Anesthesiology, Emory University School of Medicine, Atlanta, Georgia, and Hepatitis and Viral Enteritis Division, Centers for Disease Control, Phoenix, Arizona. Accepted for publication April 8, 1983. Presented in part at the annual meeting of the American Society of Anesthesiologists; Las Vegas, Nevada; October, 1982.

§ Use of commercial names is for identification only and does not imply endorsement by the Public Health Service or the United States Department of Health and Human Services.

marker of hepatitis B was 23.3%. The percentage of individuals seropositive for HBsAg, anti-HBs, and anti-HBc are given in Figure 1. There was no difference in the prevalence of serologic markers in men (20.3%) and women (26.9%) or M.D. (23.7%) and non-M.D. (22.9%) groups. The prevalence of hepatitis B markers showed a statistically significant increase with time since graduation from medical school (M.D.), nursing school, or college (non-M.D.) (fig. 2). There was a trend toward increasing prevalence with age, but this was not statistically significant ($P = 0.20$).

Eighty-one of the subjects reported no history of clinical hepatitis, but 16 (19.8%) of those with a negative history had positive serologic markers for hepatitis B. Five subjects reported that they had knowledge of having hepatitis prior to the study. Only one of these individuals had hepatitis prior to entering anesthesia training, and he was seronegative for hepatitis B. The other four had positive markers for hepatitis B.

The majority of the subjects (83.7%) reported that they had accidentally stuck themselves with a needle used on a patient. Nineteen (26.4%) with a history of a needlestick and one (7.1%) of those denying accidental needlestick had positive markers of hepatitis B. This difference is not statistically significant ($P = 0.10$). Of those who experienced an accidental needlestick, seven thought that the needle had been used on a patient with hepatitis. Two of these seven subjects (28.6%) had serum indicators of hepatitis B, while 25.4% of the others with accidental needle punctures were seropositive ($P = 0.58$). Twelve subjects had received hepatitis B immune globulin after needlesticks. Only three subjects receiving the globulin had positive serum markers; one had both HBsAg and anti-HBc and two had both anti-HBs and anti-HBc. This indicates that these serologic markers were not acquired passively from the globulin but were acquired from contact with the hepatitis B virus.

Only 64% of those studied routinely question patients about a history of viral hepatitis. Of the personnel that do inquire, 27.3% were seropositive, which does not differ ($P = 0.24$) from the 16.1% prevalence in those who do not ask. Seventy subjects routinely wore gloves when caring for patients who they determined had a high risk of transmitting hepatitis based on history, physical examination, or general appearance. Eighteen of the 70 (25.7%) were seropositive for hepatitis B.

Discussion

The 23.3% prevalence of serologic markers of hepatitis B that we found in this group of anesthesiologists, nurse anesthetists, and anesthesia assistants is much greater than the 3–5% reported for the general population.^{1,7} The fivefold to sevenfold increase is similar to that found in

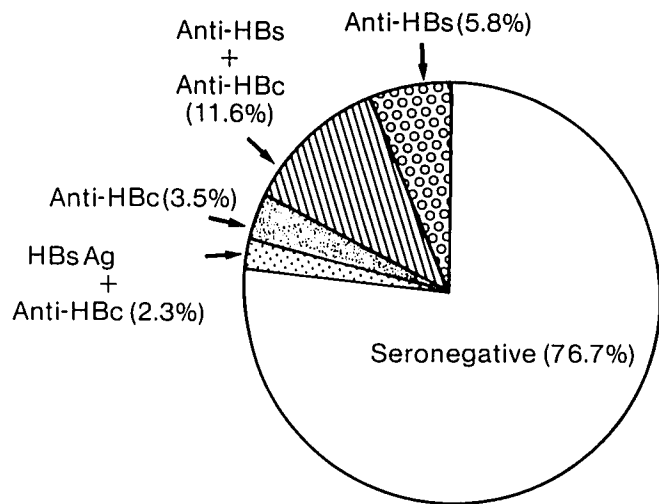


FIG. 1. Prevalence of serologic markers of hepatitis B in 86 anesthesia personnel.

other surveys of health workers who are regularly exposed to blood or other body fluids that can transmit hepatitis B virus.^{1,2} The prevalence of anti-HBs that we observed

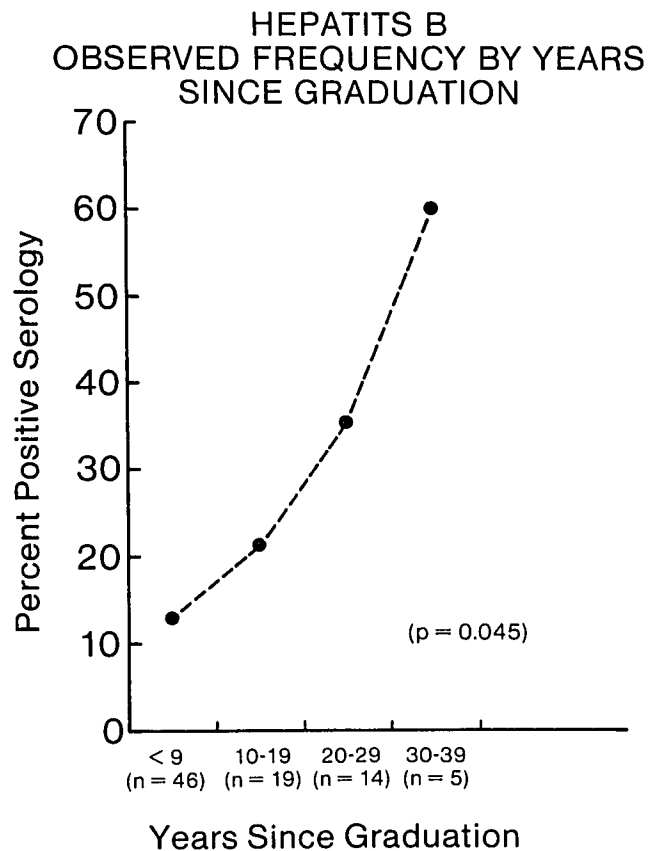


FIG. 2. The prevalence of positive serologic markers of hepatitis B in anesthesia personnel according to the time since graduation from medical school (M.D.s) or college and nursing school (non-M.D.s).

was comparable to the 17% frequency found in anesthesiologists by Denes *et al.* who surveyed physicians attending three national meetings.² By measuring anti-HBc, we identified an additional 5.8% with previous exposure to hepatitis B virus that would have gone undetected had we surveyed for anti-HBs alone (fig. 1). In addition, we also were able to study over 80% of all possible anesthesia personnel in the four hospitals compared with the 10.6% sampling rate in the other reported series of anesthesiologists.

The prevalence of hepatitis B markers was not different in our M.D. and non-M.D. groups. At the hospitals in which our subjects worked, physician anesthesiologists routinely supervise and direct the administration of anesthesia by residents, nurse anesthetists, or anesthesia assistants. In spite of less physical contact with patients, physician anesthesiologists' exposure was similar to the other anesthesia personnel based on the serologic markers. Although senior anesthesiologists in general spend a lower percentage of time with patient care because of increasing administrative, teaching, and research duties, the prevalence of hepatitis B markers increased with time in the specialty. We did not include anesthesia residents in our study because of their short time of increased exposure.

Most of the individuals with serum markers of hepatitis B had no clinical history of hepatitis. All subjects who had clinical hepatitis after entering the specialty of anesthesia had serologic markers for hepatitis B, and, therefore, this virus was the presumed cause. Almost 20% of anesthesia personnel without a history of hepatitis had positive markers after a subclinical infection. With resolution of acute hepatitis B infection, antibodies to the core antigen are produced followed by the formation of antibodies to the surface antigen. A total of 17.4% of our subjects were either only anti-HBc positive or anti-HBc and anti-HBs positive and thus had been infected with the hepatitis B virus. Five of the 86 anesthesia personnel (5.8%) in our study were anti-HBs positive and anti-HBc negative, and three of this group had borderline positive tests (less than 10 sample ratio units). The presence of only anti-HBs could be from a remote infection so that anti-HBc was no longer detectable, from the effect of repeated exposure to HBsAg that produced immunization but not infection, or from false-positive test results at the borderline sensitivity of the assay. This serologic pattern has been observed in a previous study of hospital personnel,¹ but the significance of this pattern is currently unclear.

Clinical history is an unreliable method of detecting HBsAg seropositive patients. In a survey of patients admitted to a large metropolitan hospital, 0.9% were HBsAg positive.⁸ Only 17% of the seropositive patients had a diagnosis of hepatitis noted in their medical records. In

our study, subjects who reported that they had experienced an accidental needlestick did not have a statistically higher prevalence of serologic markers for hepatitis B. The frequency of seropositivity did not differ in those subjects who thought the needle had come from nine patients without evidence of hepatitis. Only 64% of the anesthesia personnel routinely attempted to obtain a history of viral hepatitis from their patients. The prevalence of serum markers in those who asked was not different from those who did not. It is impractical to screen all patients with serologic tests for hepatitis B viral markers, and it appears that information from history and physical examination is not adequate for identification of viral carriers.

Although 80% of the anesthesia personnel studied said that they currently wore gloves when contacting patients suspected of having the potential to transmit hepatitis, almost 26% of this group were seropositive. Gloving by anesthesia personnel may be useful in preventing the transmission of hepatitis B when contacting patients with a history of HBsAg positivity. The failure of gloving to completely prevent hepatitis B infection in our study may be due to infection of personnel prior to the adoption of their present gloving practice, infection from a carrier with a negative hepatitis history,⁹ infection through a site other than the hands, or needle puncture wounds that gloving does not prevent. Body fluids such as saliva and serum exudates are capable of carrying hepatitis B virus and may be sources of infection.¹⁰ The hepatitis B virus remains stable on environmental surfaces, and through contact with these surfaces, individuals may become infected.¹¹ Gloves may not have prevented transmission of the virus if blood or other fluid were splashed directly onto the eye, mucosa, or broken skin or onto a surface that was touched after ungloving.

Prior to this study, many of the individuals involved were not appropriately aware of the occupational risk of hepatitis B. Personnel who administer anesthesia need to appreciate this hazard and modify their practice to prevent self-infection. This includes meticulous care to avoid skin or mucous membrane contact with blood or secretions from HBsAg-positive patients and proper disposal or sterilization of any contaminated equipment. Because it is difficult to identify patients who pose a risk to anesthesia personnel, the timing of the need for appropriate protective measures is uncertain. Immunization against hepatitis B is now possible, since an inactivated hepatitis B virus vaccine is available. Immunization protects against active infection by the virus and appears to be the best method of preventing the disease in groups who have frequent contact with carriers.^{6,7} Because of the high prevalence of serologic markers of hepatitis B in anesthesia personnel, individuals entering the specialty and those in

active practice should be considered at high risk. Therefore, we recommend that these groups receive immunization against the hepatitis B virus.

The authors thank Joyce Johnson, D.O., and Brian T. Clark, for their assistance with statistical analysis of the data, and Bert L. Murphy and Alfred S. Yin, B.S., for technical assistance.

References

1. Dienstag JL, Ryan DM: Occupational exposure to hepatitis B virus in hospital personnel: infection or immunization? *Am J Epidemiol* 115:26-39, 1982
2. Denes AE, Smith JL, Maynard JE, Doto IL, Berquist KR, Finkel AJ: Hepatitis B infection in physicians: Results of a nationwide seroepidemiologic survey. *JAMA* 239:210-212, 1978
3. Nomura A, Stemmermann GN, Wasnich RD: Presence of hepatitis B surface antigen before primary hepatocellular carcinoma. *JAMA* 247:2247-2249, 1982
4. Bréchet C, Nalpas B, Couroucé AM, Duhamel G, Callard P, Carnot F, Tiollais P, Berthelot P: Evidence that hepatitis B virus has a role in liver-cell carcinoma in alcoholic liver disease. *N Engl J Med* 306:1384-1387, 1982
5. Buynak EB, Roehm RR, Tytell AA, Bertland AU, Lampson GP, Hilleman MR: Vaccine against human hepatitis B. *JAMA* 235:2832-2834, 1976
6. Szmuness W, Stevens CE, Harley EJ, Zang EA, Oleszko WR, William DC, Sadovsky R, Morrison JM, Kellner A: Hepatitis B vaccine: Demonstration of efficacy in a controlled clinical trial in a high-risk population in the United States. *N Engl J Med* 303:833-841, 1980
7. ACIP: Inactivated hepatitis B virus vaccine. Morbidity and Mortality Weekly Report 31:317-322, 327-328, 1982
8. Maynard JE. Viral hepatitis as an occupational hazard in the health care profession. *Viral Hepatitis*. Edited by Vyas GN, Cohen SN, Schmid R. Philadelphia, The Franklin Institute Press, 1978 pp 321-331
9. Goebel WM: Reliability of the medical history in identifying patients likely to place dentists at an increased hepatitis risk. *J Am Dent Assoc* 98:907-913, 1978
10. Villarejos VM, Visoná KA, Gutiérrez DA, Rodríguez A: Role of saliva, urine, and feces in the transmission of type B hepatitis. *N Engl J Med* 291:1375-1378, 1974
11. Bond WW, Favero MS, Peterson NJ, Gravelle CR, Ebert JW, Maynard JE: Survival of hepatitis B virus after drying and storage for one week. *Lancet* 1:550-551, 1981