Hepatitis and hepatitis B surface antigen and antibody in dentists

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Dentists were surveyed regarding a history of hepatitis and the presence in the blood of hepatitis B surface antigen (HB_sAg) and antibody (anti-HB_s) to determine whether they were at high risk of exposure to hepatitis B virus. Of 288 Canadian dentists 5.2% gave a history of hepatitis after graduation. This proportion is similar to that for 1462 Ontario dentists (6.3%) and that for 3162 accountants (5.1%) who had previously completed a mailed questionnaire. One dentist (0.3%) was HB_sAg-positive and 42 (14.6%) were anti-HB_s-positive. Of 210 healthy volunteer blood donors matched for age, sex and ethnic origin with the group of dentists none was HB_sAg-positive and 2.9%, significantly fewer ($P < 0.005$), were anti-HB_s-positive. Among Ontario blood donors 0.3% were HB_sAg-positive and 3% were anti-HB_s-positive. Thus, in Canada, dentists are not at increased risk of acquiring clinical hepatitis or becoming carriers, but they are more likely than other groups to have anti-HB_s in the blood. Among dentists from outside Canada a higher proportion had a history of hepatitis (10.3%) and were HB_sAg-positive (1.6%), but approximately the same proportion were anti-HB_s-positive (15.9%).

Une enquête a été menée chez les dentistes afin de déceler des antécédents d'hépatite et la présence dans le sang de l'antigène de surface de l'hépatite B (HB_sAg) et de l'anticorps (anti-HB_s) pour déterminer s'ils présentaient un risque élevé d'exposition au virus de l'hépatite B. Parmi 288 dentistes canadiens 5.2% avaient des antécédents d'hépatite après la graduation. Ce rapport est semblable à celui retrouvé chez 1462 dentistes ontariens (6.3%) et à celui de 3162 comptables (5.1%) qui avaient précédemment rempli un questionnaire distribué par la poste. Un dentiste (0.3%) était positif pour l'antigène HB_sAg et 42 (14.6%) étaient positifs pour l'anticorps anti-HB_s. Chez 210 donneurs de sang volontaires et sains appariés pour l'âge, le sexe et l'origine ethnique avec le groupe de dentistes aucun n'était positif pour l'antigène HB_sAg et 2.9%, significativement moins ($P < 0.005$), étaient positifs pour l'anticorps anti-HB_s. Parmi les donneurs de sang de l'Ontario 0.3% étaient positifs pour l'antigène HB_sAg et 3% étaient positifs pour l'anticorps anti-HB_s. Donc, au Canada, les dentistes ne sont pas davantage exposés à contracter une hépatite clinique ou à devenir des porteurs sains, mais ils sont plus susceptibles que d'autres groupes de présenter des anticorps anti-HB_s dans leur sang. Parmi les dentistes étrangers au Canada une proportion plus considérable avait des antécédents d'hépatite (10.3%) et était positive pour l'antigène HB_sAg (1.6%), mais à peu près la même proportion était positive pour l'anticorps anti-HB_s (15.9%).

Acquiring hepatitis B virus infection is a hazard for health personnel, particularly those that work with blood, such as laboratory workers, surgeons, hematologists, phlebotomists, pathologists and renal dialysis personnel.[1-4] It is important to determine which professionals are at risk because taking precautions to avoid exposure to the hepatitis B virus has been shown to reduce the risk of acquiring the infection.[5,6]

Dentists might be suspected of being at moderate risk of acquiring hepatitis B infection because it has been shown that hepatitis B surface antigen (HB_sAg) is present either continuously or intermittently in the saliva of a large proportion of HB_sAg carriers.[7,8] In addition, dentists often work in a field contaminated with blood, and most use gloves only when doing oral surgery.[9]

The frequency of exposure to and infection by hepatitis B virus during a professional career can be estimated by asking about a history of overt hepatitis and doing serologic tests for HB_sAg and the corresponding antibody, anti-HB_s. Several studies attempting to determine the risk of hepatitis B infection in dentists by these methods have yielded conflicting results.[9-14] The survey described in this paper, which was based on a questionnaire and blood tests for HB_sAg and anti-HB_s, was carried out at meetings of the International College of Dentistry and the Toronto Dental Academy in an attempt to resolve some of the conflicting data.

Methods

Of dentists attending the 1977 annual meetings of the International College of Dentistry and the Toronto Dental Academy 414 agreed to participate in the study. Of these, 219 were from Ontario, 69 from the rest of Canada and 126 from outside Canada. Since subsequent analysis showed that the results for dentists from Ontario were the same as those for dentists from the rest of Canada, the two groups were pooled to form one group of 288 dentists from Canada. The geographic origin (region of current practice) of the dentists from outside Canada was as follows: the British Isles 31, Scandinavia 20, northern Europe 19, the United States 17, the Middle East 11, Australia and New Zealand 9, Africa 8, the Mediterranean countries 5, the Caribbean islands and South America 3 and the Philippines 3.

A survey station was set up at each convention and volunteers filled in a questionnaire that asked their age, sex and ethnic origin, whether they used gloves, if they had a history of hepatitis or blood transfusions or both (and when), their alcoholic intake, their date of graduation, and the subspecialty they were practising. Blood was then drawn, separated and tested for HB_sAg and anti-HB_s by radioimmunoassay (Ausria II and AusAB, respectively, Abbott Laboratories Limited, Montreal). The serum glutamic pyruvic transaminase (SGPT) concentration was measured by a modified kinetic spectrophotometric method.

Analysis of the data from the two groups (Canadian and non-Canadian) was then carried out to determine the frequency of a history of hepatitis, of HB_sAg and anti-HB_s in the blood, and of hepatitis before graduation as compared with after graduation, the

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proportion with detectable anti-HB_s among those with a history of hepatitis before or after graduation, the possible sources of hepatitis B infection in the dentists who were serologically positive, and the relation of a history of hepatitis and anti-HB_s positivity to the number of years in practice.

As control data for a history of hepatitis, the results of a questionnaire previously mailed to accountants were used. Serving as controls for the HB_sAg and anti-HB_s studies were 210 healthy volunteer blood donors matched for age, sex and ethnic origin with the group of dentists. The dentists ranged in age from 25 to 81 years and the average age was 40.5 years. The average age of the control group was 40 years. In the group of 288 Canadian dentists there were 24 women, and in the control group there were 15 women. Most of the subjects in both groups were from Canada and a few were from northern Europe.

All dentists were advised of their test results. Those who were HB_sAg-positive were advised to see their physician.

Results

As can be seen from Table I, 5.2% of the dentists practising in Canada and 10.3% of those practising outside Canada had a history of hepatitis after graduation. The frequency of hepatitis after graduation in Canadian dentists corresponds very closely to the rates determined in a previous study: 6.3% in 1462 dentists practising in Ontario and 5.1% in 3162 accountants who completed a mailed questionnaire.[9]

Only one Canadian dentist was HB_sAg-positive, for a frequency of 0.3%, the same as in Ontario blood donors (D.M. Wrobel: unpublished data, 1977). Two (1.6%) of 126 dentists practising outside Canada were HB_sAg-positive; one was from Germany and one from the Philippines, an area where the proportion of inhabitants carrying hepatitis antigen is high. Of the 210 matched blood donors none was HB_sAg-positive. Thus, although the number studied was small, the frequency of HB_sAg positivity in Canadian dentists does not appear to be relatively high in comparison with that for other groups of Canadians. No conclusions can be drawn about the non-Canadian dentists because of the lack of a control group.

Of the Canadian dentists 14.6% were anti-HB_s-positive, whereas of the non-Canadian dentists 15.9% were anti-Hb_s-positive. Of 1000 Ontario blood donors 3% were anti-HB_s-positive,[15] and of the 210 matched blood donors 2.9% were positive. Thus, the Canadian dentists had a significantly higher frequency ($P < 0.005$) of anti-HB_s positivity than the blood donors.

Of the 15 Canadian dentists who had hepatitis after graduation 11 (73.3%) were anti-HB_s-positive, whereas of the 11 who had hepatitis before graduation only 3 (27.3%) were anti-HB_s-positive (Table II). Among the non-Canadian dentists 7 of the 13 who had hepatitis after graduation were anti-HB_s-positive, whereas none of the 5 who had hepatitis before graduation was positive. The interval between hepatitis and testing was 27 years in the Canadian group and 25 years in the non-Canadian group for those who had hepatitis before graduation, compared with 13 and 12 years respectively for those who had hepatitis before graduation.

Of the 42 dentists from Canada who were anti-HB_s-positive 13 (31.0%) gave a history of hepatitis after graduation, 3 (7.1%) a history of hepatitis before graduation and 3 a history of blood transfusions (Table III). Of the 20 non-Canadian dentists who were anti-HB_s-positive 9 (45%) had had hepatitis after graduation, none had had hepatitis before graduation and 2 (10%) had received blood transfusions.

A history of hepatitis was found most frequently in the dentists who had practised for 20 to 49 years (in 11.0%), and anti-HB_s was found most frequently in the dentists who

Table I—Frequency of history of hepatitis after graduation and of hepatitis B surface antigen (HB_sAg) and antibody (anti-HB_s) in the blood in dentists

Location of practice	No. (and %) of dentists with		
	History of hepatitis after graduation	HB_sAg	Anti-HB_s
Canada (n = 288)	15 (5.2)	1 (0.3)	42 (14.6)
Outside Canada (n = 126)	13 (10.3)	2 (1.6)	20 (15.9)

Table II—Frequency of anti-HB_s in dentists with a history of hepatitis after or before graduation

Location of practice and period	No. (and %) of dentists with anti-HB_s
Canada	
After graduation (n = 15)	11 (73.3)
Before graduation (n = 11)	3 (27.3)
Outside Canada	
After graduation (n = 13)	7 (53.8)
Before graduation (n = 5)	0 (0)

Table III—Frequency of history of hepatitis and blood transfusions in anti-HB_s-positive dentists

Location of practice	No. (and %) of dentists with		
	Hepatitis after graduation	Hepatitis before graduation	History of blood transfusions
Canada (n = 42)	13 (31.0)	3 (7.1)	3 (7.1)
Outside Canada (n = 20)	9 (45.0)	0 (0)	2 (10.0)

Table IV—Relation of history of hepatitis and presence of anti-HB_s in the blood to years in dental practice

No. of years in practice	No. (and %) of dentists with	
	History of hepatitis	Anti-HB_s
0-9 (n = 155)	6 (3.9)	17 (11.0)
10-19 (n = 96)	4 (4.2)	13 (13.5)
20-29 (n = 124)	13 (10.5)	27 (21.8)
30-49 (n = 39)	5 (12.8)	5 (12.8)

had practised for 20 to 29 years (in 21.8%) (Table IV).

The three dentists who had mildly elevated SGPT values (57, 71 and 82 IU/L) gave a history of hepatitis 5, 10 and 17 years previously. All three were anti-HB_s-positive and two drank roughly 110 to 170 mL of alcohol per day.

Discussion

In our previous study[9] 6.3% of 1462 Canadian dentists reported having had hepatitis during their professional career, compared with 5.1% of 3162 accountants; in our current study 5.2% of 288 Canadian dentists reported such a history. Hence in Canada there was definitely no difference between dentists and a control group of other professionals regarding a history of hepatitis.

In the United States the findings have not been uniform: in one study there appeared to be a higher frequency of a history of hepatitis in dentists, and in another there appeared to be no such disparity. Mosley and colleagues[12,13] studied two groups of dentists, one in the Los Angeles area and one (1245 dentists) at an American Dental Association convention. They found the frequency of a history of hepatitis in the two groups to be 3.3% and 3.2% respectively. Feldman and Schiff[11] in Miami found that 6.7% of dentists reported a history of hepatitis, compared with 2.4% of a control group of lawyers; the latter frequency is not strikingly different from the frequencies calculated by Mosley and colleagues for dentists.

Of the dentists in our current study 0.3% were found to carry HB_sAg in the blood; among Ontario blood donors the frequency was the same (D.M. Wrobel: unpublished data, 1977). In the United States Mosley and associates[13] calculated the frequency of HB_sAg positivity to be 0.9% in dentists and 0.2% to 0.38% in American Red Cross volunteer blood donors, while Feldman and Schiff[11] found the frequency to be 1.27% in dentists and 1.05% in a control group. In Denmark the frequency was determined by Neilsen[14] to be 0% in dentists and 0.1% in volunteer blood donors. Thus it appears that in Canada, the United States and Denmark the frequency of HB_s antigenemia is not relatively high in dentists.

In our study 15.9% of the dentists practising outside Canada were positive for anti-HB_s, compared with 3% of 1000 volunteer blood donors and 2.9% of 210 volunteer blood donors matched for age, sex and ethnic origin. Mosley and colleagues[12,13] found 12.7% of dentists to be positive for anti-HB_s by passive hemagglutination, compared with 4.2% of Red Cross volunteer blood donors in Washington and 6.7% of unpaid donors in New York City. Similarly, the frequency of anti-HB_s was determined to be 16% in health care workers at the National Institutes of Health, Bethesda, Maryland and 8.7% in controls.[16] In Denmark Neilsen[14] found no difference in the frequency of anti-HB_s positivity between dentists (8.2%) and controls (8.4%). Thus, in Canada and the United States, but not in Denmark, the frequency of anti-HB_s positivity appears to be relatively high in dentists.

Of the dentists who had hepatitis while practising in Canada 73.3% were anti-HB_s-positive, whereas of the dentists who had hepatitis while practising outside Canada 53.8% were anti-HB_s-positive. The higher frequency of hepatitis after graduation (10.3% v. 5.2% to 6.3%) and the lower frequency of anti-HB_s positivity in dentists from outside Canada may reflect an increase in the proportion of cases of hepatitis of a type other than B in those areas. Of the dentists who had hepatitis before graduation only 27.3% of those practising in Canada were anti-HB_s-positive; the proportion for those practising outside Canada was 0%. Thus, a dentist is much more likely to have anti-HB_s if he or she contracted hepatitis while in practice rather than before entering practice. This may be because of the longer interval between the episode of hepatitis and the testing for anti-HB_s in the dentists who had hepatitis before entering practice and the consequent loss of detectable antibody, or it may be because dentists are more likely to be exposed to hepatitis B after entering practice than before.

Of the 42 anti-HB_s-positive Canadian dentists 19 (45%) had had either hepatitis or blood transfusions, and of the 20 anti-HB_s-positive non-Canadian dentists 11 (55%) had had either hepatitis or blood transfusions. Thus, factors that may account for anti-HB_s positivity existed in about half the dentists tested.

It appears that a history of hepatitis is most frequent among dentists who have practised for 20 to 49 years, and anti-HB_s positivity is most frequent among dentists who have practised for 20 to 29 years. Prolonged exposure or increased susceptibility to infection with increasing age may be responsible.

Some studies have lacked carefully matched controls; most serologic investigations have used volunteer blood donors as controls. The evidence suggests that, compared with other groups, dentists may have a higher frequency of hepatitis in the United States, but not in Canada or Denmark. The proportion with HB_sAg positivity is probably no higher in dentists than in other groups in these three countries, but the proportion with anti-HB_s positivity is higher in dentists in the United States and Canada, but not in Denmark. Thus, among dentists tested in the United States and Canada there was evidence of increased exposure to hepatitis B infection, while in Denmark there was no such evidence.

Differences from country to country in frequency of hepatitis and in immunologic response may be due to differences in frequency of hepatitis B and the hepatitis B carrier state in the people dentists treat, or to differences in technique or resistance to infection in dentists of different countries.

Because we have demonstrated increased exposure to hepatitis B infection among dentists in Canada, we believe that studies to determine whether changes in technique (e.g., wearing gloves) that would reduce the risk of exposure to this infection are indicated.

This study was supported by a grant from Mount Sinai Institute.

References

1. SUTNICK AI, LONDON WT, MILLMAN I, et al: Ergaseric hepatitis: endemic hepatitis associated with Australia antigen in a research laboratory. *Ann Intern Med* 75: 35, 1971
2. ROSENBERG JL, JONES DP, LIPITZ LR, et al: Viral hepatitis: an occupational hazard to surgeons. *JAMA* 223: 395, 1973
3. WANDS JR, WALKER JA, DAVIS TT, et al: Hepatitis B in an oncology unit. *N Engl J Med* 291: 1371, 1974

4. BISHAI FR, MACMILLAN S, DEMPSTER G, et al: Frequency of hepatitis B surface antibody (anti-HB_s) in various Canadian populations as measured by modified solid-phase radioimmunoassay. *Can J Microbiol* 23: 92, 1977
5. Reports of the Advisory Group on Hepatitis and the Treatment of Chronic Renal Failure, Department of Health and Social Security, London, 1970 and 1972
6. Decrease in the incidence of hepatitis in dialysis units associated with prevention programme. *Br Med J* 4: 751, 1974
7. WARD R, BORCHERT P, WRIGHT A, et al: Hepatitis B antigen in saliva and mouth washings. *Lancet* 2: 726, 1972
8. FEINMAN SV, KRASSNITSKI O, SINCLAIR JC, et al: Hepatitis B surface antigen in saliva of HB_sAg carriers. *J Lab Clin Med* 85: 1042, 1975
9. BERRIS B, FEINMAN SV, SINCLAIR JC, et al: Frequency of hepatitis in dentists in Ontario (C). *Ann Intern Med* 81: 699, 1974
10. JONES DM, TOBIN JO, TURNER EP: Australia antigen and antibodies to Epstein Barr virus, cytomegalovirus and rubella virus in dental personnel. *Br Dent J* 132: 489, 1972
11. FELDMAN RE, SCHIFF ER: Hepatitis in dental professionals. *JAMA* 232: 1228, 1975
12. MOSLEY JW, WHITE E: Viral hepatitis as an occupational hazard of dentists. *J Am Dent Assoc* 90: 992, 1975
13. MOSLEY JW, EDWARDS VM, CASEY G, et al: Hepatitis B virus infection in dentists. *N Engl J Med* 293: 729, 1975
14. NIELSEN JO: What shall we do with the HB_sAg carrier? *Scand J Gastroenterol* 11: 641, 1976
15. SINCLAIR JC, FEINMAN SV, WROBEL DM, et al: Hepatitis B surface antigen and antibody in asymptomatic blood donors. *JAMA* 235: 1014, 1976
16. LEWIS TL, ALTER HJ, CHALMERS TC, et al: A comparison of the frequency of hepatitis-B antigen and antibody in hospital and nonhospital personnel. *N Engl J Med* 289: 647, 1973

BOOKS

continued from page 1039

THE BATTERED CHILD SYNDROME. Selwyn M. Smith. 292 pp. Illust. Butterworths & Co. (Publishers) Ltd., Reading, Massachusetts, 1975. $17.50. ISBN 0-407-00046-1

BIOLOGY OF BRAIN TUMORS. A Series of Workshops on the Biology of Human Cancer. Report no 5. UICC Technical Report Series — vol 30. Edited by O.D. Laerum, D.D. Bigner and M.F. Rajewsky. 209 pp. Illust. International Union Against Cancer, Geneva, 1978. Price not stated. ISBN 92-9018-030-7

continued on page 1065