

Hepatitis B Prevalence and Infection Control Among Dental Health Care Workers in a Community in South Korea

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Abstract

Objectives: The objectives of this study were to investigate the prevalence of hepatitis B vaccine and use of infection control procedures by dental health care workers in Taegu, South Korea. **Methods:** Information was obtained with a mailed questionnaire sent to 300 private dental practices. Surveys were received from 177 dentists, 104 dental hygienists, and 46 dental assistants. All dental health care workers were asked to donate a blood sample for analysis of hepatitis B surface antigen (HBsAg) and antibody (anti-HBs). **Results:** Vaccination against hepatitis B virus was reported by 63 percent of the respondents. About 40 percent of all participants answered that they were anti-HBs positive, while another 43 percent did not know their status. About 89 percent of dentists reported that they wore a mask with all patients, while hygienists (13.6%) and assistants (13.0%) were less likely to do so. Reported use of gloves (4.5%) and protective eyewear (14%) with all patients was extremely low in every group. Among the 56 dentists who were tested for HBV markers, 23 did not receive the vaccine against hepatitis B, and 13 percent (3 of 23) were positive for HBsAg as carriers. **Conclusions:** About 37 percent (120 of 327) of dental health care workers surveyed in this study in Korea did not receive the vaccine against HBV infection. Basic barrier techniques to prevent cross-contamination were not being used consistently. Nationwide guidelines for barrier techniques and hepatitis vaccinations should be developed and disseminated to dental personnel. [*J Public Health Dent* 1999;59(1):39-43]

Key Words: dental health care workers, hepatitis B, vaccination, infection control.

Use of hepatitis B vaccine and barrier techniques by dental health care workers (DHCWs) is effective in the prevention of hepatitis B infection. While knowledge of these practices in some countries is relatively complete, information about their use throughout the world is lacking. This study describes use of hepatitis B vaccine, prevalence of hepatitis B virus (HBV), and use of barrier techniques among DHCWs in Korea. Because reports regarding these issues in the Asian-Pacific rim are few, literature from other countries is discussed to provide a background on this issue.

DHCWs' risk of infection by blood-borne pathogens and respiratory viruses (1-7), and infectious transmission during dental procedures de-

pends on many factors (8). The source of infection may be a patient or a member of the dental team who is suffering from, or is a carrier of an infectious disease. Microorganisms capable of causing disease also are present in human blood and other body fluids (9,10). Contact with blood or saliva mixed with blood may transmit pathogenic microorganisms from one person to another. Furthermore, microorganisms are readily transmitted in the dental environment by touch as well as by splatter and aerosols (11). Contaminated needles, sharp instruments, and flying debris from the oral cavity are other possible routes of transmission (12,13).

Universal infection control procedures are highly recommended and

have become the standard of care in the United States because carriers of infectious diseases cannot always be identified (14). Dentists, dental hygienists, assistants, laboratory technicians, secretarial staff, and cleaning staff are all at risk from cross infection (15,16), and several studies (3-5,17-19) have found that the dental team is at higher risk of contracting infections than the general population.

Hepatitis B virus (HBV) is a relatively common infection, with over 250 million chronic carriers of HBV estimated worldwide (20). All dental health care workers are at high risk of acquiring hepatitis B through contact with patients. In the United States, the Centers for Disease Control and Prevention estimated that 300,000 new cases of HBV infections occur annually, including 12,000 in health care workers. Of these workers, 500 to 600 are hospitalized and 100 die from fulminant hepatitis, cirrhosis, or liver cancer. An additional 700 to 1,200 workers become HBV carriers (21,22). Most health care policy making organizations throughout the world strongly recommend that dental health care workers receive vaccination against hepatitis B (23-26).

The carrier rate of HBV is greater in Korea (3%-6%) than in many developed countries (27,28). Thus, the possible transmission of HBV from patients to a dentist and among patients may be higher among Korean DHCWs than other countries. What is not known is the prevalence of HBV in Korean DHCWs. One would speculate that the prevalence is higher in Korean DHCWs than in US DHCWs.

In summary, while much appears known about infection control and barrier techniques in some areas of the world, there is a lack of information

about these issues in Korea. Thus, the objectives of this study were to investigate the use of hepatitis B vaccine and infection control procedures by dental personnel in Taegu, Korea, and the prevalence of HBV among dentists in this Korean city. The underlying hypothesis is that the prevalence of HBV is higher, while the use of hepatitis B vaccine and other infection control procedures is lower in a Korean dental community compared to that of the United States.

Methods

Information was obtained from dentists, dental hygienists, and dental assistants who were actively working in Taegu, Korea. From 521 private dental offices in the published membership list of the Taegu Dental Society, 300 offices were selected randomly for this study. The selected dentists were owners of the practices.

A two-stage mailing was performed during February 1994. In stage one, a letter asking for cooperation and a consent form for the survey and a blood sample were mailed to the 300 offices. A follow-up mailing was sent to initial nonresponders. In stage two, the questionnaire was mailed to all offices consenting to participate in the survey. Following receipt of the questionnaire, each office was contacted to arrange a convenient time to withdraw a blood sample. Blood samples were analyzed for hepatitis B surface antigen (HBsAg) and antibody to the hepatitis B surface antigen (anti-HBs) in accordance with the microparticle enzyme immunoassay (MEIA) method (29) at the Department of Clinical Pathology in Kyungsang Hospital in Taegu. HBsAg and anti-HBe tests were performed only on positive subjects to HBsAg.

Early drafts of the survey instruments were pretested with small groups of dental personnel to assess the validity of the questionnaire. Twenty-five dentists who were attending a continuing dental education program were pretested and interviewed to determine content validity; they were not included in the later survey. Anonymity was assured through a unique code number known only to the survey respondent. Both the serum samples and questionnaires were assigned this code number. Participants thus were able to obtain the results of the serologic testing with

TABLE 1
Distribution of Sample by Occupation and Career Length

Years in Practice	n (%)		
	Dentist	Dental Hygienist	Dental Assistant
<5	37 (20.8)	94 (90.2)	42 (91.3)
6-10	77 (43.7)	10 (9.8)	4 (8.7)
11-15	40 (22.4)	— (—)	— (—)
≥16	23 (13.1)	— (—)	— (—)
Total	177 (100.0)	104 (100.0)	46 (100.0)

TABLE 2
Status of Hepatitis B Vaccination and Knowledge of Hepatitis B Surface Antibody State Among Dental Personnel

Occupation	n (%)				
	Vaccination		HBs Ab Positive		
	Yes	No	Yes	No	Don't Know
Dentist	112 (63.3)	65 (36.7)	88 (49.7)	39 (22.0)	47 (28.3)
Hygienist	65 (62.75)	39 (37.5)	26 (25.0)	11 (10.6)	67 (64.4)
Assistant	30 (65.2)	16 (34.8)	15 (32.6)	5 (10.9)	26 (56.5)
	207 (63.3)	120 (36.7)	129 (39.8)	55 (17.0)	140 (43.2)
	$\chi^2=0.10$, DF=2 P=.951		$\chi^2=41.23$, DF=4 P<.001		

their code number, but others were unable to identify or trace any individual.

The questionnaire asked the dental personnel to report whether they had had a hepatitis B vaccination; whether they received one, two, or three inoculations; and whether they knew their surface antibody (HBsAb) status. Subjects also were asked about their use of surgical masks, operating gloves, and protective eyewear, and the extent of using barrier techniques.

Data analyses were conducted using the SAS package. Differences in proportions were compared by the chi-square test or Fisher's exact test if any cell contained fewer than five subjects. Corresponding *P*-values were considered significant at values less than .05.

Results

From the initial sample of 300 offices, DHCWs in 183 offices (61%) responded including 177 dentists, 104 dental hygienists, and 46 dental assistants. The mean ages of participants were as follows: dentists, 37.6 years

(range=26-69); dental hygienists, 25.8 years (range=20-36); and dental assistants, 25.1 years (range=20-28). The distribution of responding subjects by length of career is shown in Table 1. As expected, dental hygienists and assistants were younger and had fewer years in practice than dentists.

Table 2 shows self-reported state of vaccination against HBV infection and knowledge of anti-HBs of the dental personnel. Some DHCWs did not respond to all questions, and nonrespondents were dropped from the analysis. No statistical difference was found among the different occupations regarding vaccination status. Sixty-three percent of all DHCWs had reported receiving the vaccine. However, about 40 percent of respondents answered they had anti-HBs, while 17 percent reported they did not have surface antibody. Correspondingly, 43 percent of respondents did not know their hepatitis antibody status. Dentists were more likely to know their status than other dental personnel (*P*<.001). Among the 207 DHCWs who answered they had been vaccinated

against HBV infection, 76 percent answered they had received all three inoculations, 9 percent had one inoculation, and the other 15 percent answered they had two inoculations.

Table 3 displays the use of personal barrier techniques for infection control by all DHCWs. The findings from this survey reveal that dentists more than dental hygienists and dental assistants use barrier techniques ($P<.001$). However, the use of gloves and protective eyewear, regardless of the dental occupation, was consistently low. About half of respondents (54.3%) wore masks with all patients; 85 (26.1%) wore masks sometimes; and 64 (19.6%), never. Dentists were much more likely than hygienists or assistants to wear a face mask ($P<.001$). As for wearing operating gloves, only 4.5

percent of dentists answered they always wore gloves with all patients. Of the respondents, 174 (51.9%) wore gloves sometimes. About 70 percent of dental hygienists and 76 percent of dental assistants responded that they did not use gloves. Interestingly, more than twice as many dentists reported using eyewear with all patients (14%) than using gloves with all patients (5%). Ten percent of dentists reported not wearing eye protection. Protective eyewear was not used by 61 percent of dental hygienists and 80.4 percent of dental assistants.

When comparing use of barrier techniques of dentists across "years in practice" (Table 4), a pattern emerges. Those in practice longer were less likely to use barrier techniques. A statistically significant association was

found between glove use and recent graduation from dental school ($P<.05$). Sixty-six dentists and 37 dental hygienists agreed to have venous blood withdrawn for the purpose of analyzing immunological markers for hepatitis B. Ten dentists did not complete the process, resulting in 93 analyzed blood samples.

Table 5 shows serologic markers for hepatitis B among vaccinated and nonvaccinated dentists. Of the 56 dentists sampled, three (5.4%) had HbsAg, 37 (66%) had anti-HBs, and 16 (28.6%) did not have either HbsAg or anti-HBs. Among the 33 dentists vaccinated against HBV infection, 25 (76%) had successfully seroconverted, but eight (24%) did not seroconvert or dropped to undetectable levels. Also, 12 dentists were exposed to HBV by an unknown route without experience of vaccination.

Interestingly, when the 33 vaccinated dentists were asked about their antibody status, only 12 accurately knew their current status. Three believed they had antibodies when, in fact, they did not; eight believed they did not have antibodies against HBV when they did. Of the 23 nonvaccinated dentists, two did not have antibodies when they believed the opposite and one had antibodies, but thought otherwise.

Discussion

Data reported in this analysis were collected from a sample of dentists, dental hygienists, and dental assistants in a single city, and thus may not be representative of the larger population of Korean dental personnel. Similarly, self-reported questionnaires are subject to participants' reporting biases. Considering the nature of the

TABLE 3
Use of Basic Barrier Techniques for Infection Control

Occupation	n (%)		
	Face Mask	Gloves	Eyewear
Dentist (n=177)			
All patients	157 (88.7)	8 (4.5)	24 (13.6)
Sometimes	19 (10.7)	132 (74.6)	136 (76.8)
Never	1 (0.6)	37 (20.9)	17 (9.6)
Hygienist (n=104)			
All patients	14 (13.6)	1 (0.9)	3 (2.7)
Sometimes	52 (50.5)	30 (28.8)	38 (36.6)
Never	37 (35.9)	73 (70.2)	63 (60.5)
Assistant (n=46)			
All patients	6 (13.0)	1 (2.2)	0 (0.0)
Sometimes	14 (30.5)	10 (21.7)	9 (19.6)
Never	26 (56.5)	35 (76.1)	37 (80.4)
	$\chi^2 = 202.87, DF=4$ $P<.001$	$\chi^2 = 89.37, DF=4$ $P<.001$	$\chi^2 = 124.36, DF=4$ $P<.001$

TABLE 4
Dentists' Use of Basic Barrier Techniques for Infection Control by Years in Practice

Years	n (%)								
	Face Mask			Gloves*			Eyewear		
	Always	Sometimes	Never	Always	Sometimes	Never	Always	Sometimes	Never
≤10 (n=113)	104 (91.2)	9 (7.8)	0	5 (4.4)	90 (79.6)	18 (15.9)	82 (72.5)	19 (16.8)	12 (10.6)
>10 (n=64)	53 (84.1)	10 (15.8)	1 (0.6)	3 (4.6)	42 (65.6)	19 (29.7)	50 (78.1)	9 (14.6)	5 (7.8)

* $P=.048$.

TABLE 5
Serologic Markers for Hepatitis B of Vaccinated and Nonvaccinated Dentists

Vaccination	n (%)		
	HbsAg(-) HbsAb(-)	HbsAg(+) HbsAb(-)	HbsAg(-) HbsAb(+)
Yes (n=33)	8 (24.2)	0	25 (75.7)
No (n=23)	8 (34.8)	3 (13.0)	12 (52.2)
Total (n=56)	16 (28.6)	3 (5.4)	37 (66)

subject of this investigation, one could speculate that the results underestimate noncompliance of universal precautions and infection control procedures. However, the results provide insight about infection control activities in this population of dental health care workers.

Several studies (3-6,17-20,30) have attempted to define the risk of infection for dental personnel. It has been suggested that members of the dental team have a higher risk than the general population of contracting infections and sustaining physical or chemical damages.

Ample evidence supports the transmission of hepatitis B from patient to dental staff and, less commonly, from dental staff to patients (30-34). All DHCWs should receive an HBV vaccination (23-26). This recommendation is based upon the knowledge that a penetrating injury from a needle, drill, or other sharp instrument cannot be prevented by the use of barrier precautions alone. Moreover, no effective treatment is available for hepatitis B. Control efforts should focus on immunization with hepatitis B vaccine and use of universal barrier techniques with all patients.

Alter et al. (35) reported a 75 percent decline between 1982 and 1988 in the number of health care workers with HBV infection. This decline is most likely associated with acceptance of universal precautions and the fact that 80 percent of all HBV vaccinations in the United States since 1982 have been among health care workers. In two Canadian reports, Roscoe and co-workers (36) reported vaccination against hepatitis B virus by 67 percent of his participants; however, Noble et al. (37) reported the inoculation rate with a hepatitis B vaccine averaged only 46 percent among dental professionals. Current research suggests that overall vaccination rates reported by partici-

pants increased from 22 percent to 85 percent between 1983 and 1992 (38).

In the present study 63 percent of the DHCWs reported receiving the vaccine. The combination of over one-third of this population not receiving the vaccine, coupled with over one-half of the dental hygienists and dental assistants and 30 percent of the dentists not knowing their antibody status, is troublesome. Clearly, more educational interventions are needed for all DHCWs, particularly for dental hygienists and assistants.

The CDC now recommends postvaccination testing of antibody titers (39). Awareness of antibody status was high in dentists (72%), but low in hygienists (36%) and assistants (44%). In Korea, a determination of one's antibody status against hepatitis B before receiving a vaccination may be prudent. Although the CDC does not make this recommendation for US DHCWs, the prevalence of hepatitis B is higher in Korea and the results from this study estimate that 21.4 percent of the unvaccinated dentists developed "natural" immunity (Table 5). It may also be prudent to recommend that posttesting be performed for DHCWs in Korea to ensure that seroconversion to a protective antibody level has occurred and/or encourage DHCWs to complete all three doses of the vaccination against HBV infection. Post-testing also can facilitate HBV exposure management. With current knowledge, equipment, and technology, HBV in the dental office can be contained. Care, caution, and use of personal barriers can minimize the risk of infection and cross-contamination.

Dentists, hygienists, and dental assistants are advised to wear an operating mask, gloves, and protective eyewear when providing dental treatment (40). Of the universal infection control precautions, gloving arguably

contributes the most to overall patient, practitioner, and staff protection. A 1981 study (41) found that only 24 percent of the 431 oral surgeons surveyed used gloves with all patients. Since 1986, it appeared that dental personnel were adopting standard barriers at a rapid rate. One study (42) found major improvement in glove use over a two-year period. Gloving for all patient treatment rose from 24 percent in 1986 to 81 percent two years later. Today, it is unusual to find US dentists and staff who do not use gloves for all patients. A 1991 study concluded that more than 90 percent of dentists, hygienists, and dental assistants surveyed used gloves for treating all patients (43).

This study suggests that the high prevalence of HBsAg among Korean dentists (13%; Table 5) may be related to the extremely low rate of using gloves (4.5%). Reports published from 1970 through 1987 indicate nine clusters in which patients were infected with HBV associated with treatment by an infected DHCW (26,44-47). However, no reports have appeared since 1987, when US dentists routinely began wearing gloves.

The findings in Table 3 suggest that educational interventions need to account for differences in preventive health behaviors among dentists, dental hygienists, and dental assistants. Further, the results of this study also suggest that dentists in practice longer than 10 years may require additional interventions to change preventive health behaviors.

The possibility of transmission of bloodborne infections from DHCWs to patients and from patients to DHCWs still exists in Korea. It is necessary to establish specific regulations or recommendations about cross-infection control in Korea, and then inform all dental health care workers about these issues.

Finally, educational interventions aimed at reducing the risk of cross-contamination in a dental office must emphasize the importance of the vaccination and compliance with the three inoculations. Our finding that three dentists who believed they had seroconverted, but did not because of uncompleted inoculations, is revealing. Because this is a small sample, a more broad-based random sample with a larger population is needed to validate these results.

Given the findings of this research,

dentists and dental personnel should be educated about the risk of infection from their patients, and about the potential for infecting their patients and each other. Then, dental personnel should take all possible steps to prevent the transmission of HBV by being vaccinated, and by using barrier techniques. Finally, dentists, dental hygienists, and assistants also must be able to communicate the facts of infection control to patients and provide specific examples of safeguards the profession is using. In sum, education, personal action, and informing others will yield reduced health risks in the dental office.

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