

Hepatitis B Virus Serological Profiles among Dental Healthcare Workers and Students in Thai Dental School

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Abstract

The wide spread epidemic of Hepatitis B Virus (HBV) infection is an important health issue in Thailand. Dental healthcare workers both non-clinical and clinical staff are at high risk of occupational exposure to the virus from contaminated blood and secretions. However, there is a little evidence on HBV exposure in these people. The aim of this study was to investigate serum hepatitis B profile among dental healthcare workers and students in a dental school in Bangkok, Thailand. Dental healthcare workers and students who had HBV serum pre-screened in 2010 were invited to participate in this retrospective study. One hundred and seventy participants consented and agreed to answer a self report-questionnaire about personal data and HBV infection risk factors. The data of their HBV serological profiles was used to compare with the personal data and the data of HBV risk factors. Prevalence ratio was used for data analysis. The results showed that the participants who had been exposed to patients' blood and secretions had a significantly higher risk of HBV infection by the detection of anti-HBc in their sera when compared to the non-exposed groups (4.72 fold, $p < 0.001$). Blood and secretions exposure can increase risk of HBV infection. Pre-exposure hepatitis B vaccination is an essential strategy for preventing clinical, non-clinical staff and dental students from occupational infection with HBV.

Key words: Blood borne pathogen; Dental students; Occupational exposure; Serological profile

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Introduction

The Hepatitis B Virus (HBV) infection is an important health issue worldwide. About 240 million of the world's population have been infected with the virus and of these, approximately 600,000 die annually from HBV-related chronic liver diseases, including cirrhosis and liver cancer.^{1,2} In Thailand, HBV is also an important health issue. There is a high prevalence of HBV infection and chronic HBV infection was reported in about 4 - 8 % of the population.³ Previous studies also reported that hepatitis viruses are associated with cholangiocarcinoma and hepatocellular carcinoma.^{4,5} After 1992, HBV vaccination is included in the vaccines for children program in Thailand. Therefore, it has helped reduce the incidence of chronic HBV infection from 4.3 % to 0.7 %.⁶

Hepatitis B virus belongs to *Hepadnaviridae* family. The full virion, 42 nm in diameter, contains nucleocapsid and surface antigen HBsAg (Hepatitis B surface antigen).^{7,8} Transmission of hepatitis B virus can occur through unprotected sexual contact, blood transfusion, contaminated needles, syringes, vertical transmission from mother to child during childbirth, and exposure to blood and body fluids containing blood.¹ Despite the use of standard universal precautions, healthcare workers, including both clinical and non-clinical staff, may be exposed to the virus in the course of their work.

So far, the most effective way to prevent HBV infection is vaccination.⁹ The HBV serological screening program should be performed to exclude a person who does not need vaccine and to check for antibody formation.^{10,11} However, there was no report about pre-vaccination screening of HBV serological profile in the group of dental students and dental healthcare workers who are working in the Faculty of Dentistry, Srinakharinwirot University. The objectives of this study were to study the serum hepatitis B profile and factors related to HBV infection among dental healthcare workers and students in the Faculty of Dentistry, Srinakharinwirot University, Thailand.

Materials and Methods

In 2010, we performed pre-vaccination screening test for HBV serological profile in dental healthcare workers and students including dental assistants, laboratory workers, janitor, dental assistant students, and pre-clinical dental students at the Faculty of Dentistry, Srinakharinwirot University, Thailand. The HBV serological screening profiles including Hepatitis B surface antigen (HBsAg), Hepatitis B surface antibody (Anti-HBs) and Hepatitis B core antibody (Anti-HBc) were investigated by Electrochemiluminescence Immunoassay (ECLIA) technique using automated modular analytics E170 machine (Roche Diagnostics Thailand) at a private laboratory in Bangkok, Thailand. All the dental healthcare workers and students who had HBV serum profile screening in 2010 were invited to participate in the study. From a total of 193 dental healthcare workers and students, 170 participants consented and agreed to answer a self report-questionnaire.

The questionnaire consisted of 3 sections: 1) Personal data including year of birth, details about participants' hometown and years of practice, 2) History of HBV prevention and vaccinations, and 3) Data of factors related to HBV exposure. In the questionnaire, the study Identification (ID) was used and only one of the researchers who was a doctor could identify the participants. The data of their HBV serological profiles was used to compare with the personal data and the data of HBV risk factors. Prevalence ratio was used to analyze the data (MedCalc Software, Ostend, Belgium). This study has been approved by the Ethics Committee, Faculty of Dentistry, Srinakharinwirot University.

Results

A total of 170 from 193 dental healthcare workers and students responded to the questionnaires for a response rate of 88.1 %. They were 81.2 % females and 18.8 % males. Table 1 shows the demographic data of the participants. The average age for all participants

was 23.5 years old. Participants were from 35 different provinces of the country, which 62 participants (36.5 %) from Bangkok (Capital city) and 25 participants (14.7 %) from Sisaket (North eastern part of Thailand). Among the 170 participants, 9 were dental assistant students (5.3 %), 115 were pre-clinical dental students (67.6 %), 36 were dental assistants (21.2 %), 9 were laboratory workers (5.3 %), and 1 was a janitor (0.6 %). All students who participated in this study had not been exposed to blood and secretions before they had their HBV screening profiles in 2010. However, dental healthcare workers who had been exposed to blood and secretions had been working in a private dental clinic or at Faculty of Dentistry for an average of 7.9 years (1 - 28 years).

The results showed that dental assistants, laboratory workers and janitor were more positive to

anti-HBc than the group of dental assistant students and dental students (Table 2). The group of healthcare workers who had been exposed to patients' blood and secretions had a significant higher risk of HBV infection by the detection of anti-HBc in their sera when compared to the groups of dental assistant students and pre-clinical dental students who had not been exposed to patients' blood and secretions prior to the serological study (PR = 4.72, $p < 0.0001$) (Table 3). The number of participants who had been exposed to HBV (positive to Anti-HBc) was 22 (12.9 %). Among these, 4 participants (18.2 %) had HBsAg positive which indicated that they had chronic HBV infection. In total, 2.4 % of all participants had chronic HBV infection. The results showed that 93 participants (54.7 %) had Anti-HBs > 10 mIU/mL while 73 participants (42.9 %) had no immunity (Table 4).

Table 1 Demographic data of the participants

Demographic data	Number	%
Number of patients	170	100
Age (years)		
< 20	7	4.1
20 - 29	141	82.9
30 - 39	18	10.6
> 39	4	2.4
Occupation		
Dental assistant student	9	5.3
Dental student	115	67.6
Dental assistant	36	21.2
Laboratory worker	9	5.3
Janitor	1	0.6

Table 2 Results of Anti-HBc distributed by occupation

Occupation	Positive Anti-HBc		Negative Anti-HBc	
	Number	%	Number	%
Dental assistant student N = 9	1	11.1	8	88.9
Dental student N = 115	7	6.1	108	93.9
Dental assistant N = 36	11	30.6	25	69.4
Laboratory worker N = 9	2	22.2	7	77.8
Janitor N = 1	1	100	0	0

Table 3 Results of Anti-HBc serological profiles in exposed and non-exposed groups

Sample Group	(%) Number		
	Positive Anti-HBc	Negative Anti-HBc	Total
Exposed to blood and secretions*	14 (30.4)	32 (69.6)	46 (27.1)
Non - Exposed to blood and secretions**	8 (6.5)	116 (93.5)	124 (72.9)
Total	22 (12.9)	148 (87.1)	170 (100)

Prevalence ratio = 4.72
95 % Confidence interval = 2.12 - 10.50; $p < 0.0001$

* Group of dental assistant, laboratory workers and janitor

** Group of dental assistant students and pre-clinical dental students

Table 4 Results of HBsAg and Anti-HBs distributed by occupation

Sample Group	(%) Number			Total
	Positive HBsAg	Positive Anti-HBs	Negative Anti-HBs	
Dental assistant student	1 (11.1)	2 (22.2)	6 (66.7)	9 (5.3)
Dental student	3 (2.6)	68 (59.1)	44 (38.3)	115 (67.6)
Dental assistant	0 (0)	20 (55.6)	16 (44.4)	36 (21.2)
Laboratory worker	0 (0)	2 (22.2)	7 (77.8)	9 (5.3)
Janitor	0 (0)	1 (100)	0 (0)	1 (0.6)

Table 5 shows factors related to the risk of HBV infection among the dental healthcare workers and students. Factors that increased the risk of HBV infection among the dental healthcare workers and

students were transmission from HBV infected mother (5.57 fold), unprotected sexual contact (4.15 fold), HBV carrier in the family (2.98 fold) and exposure to dental environment without immunization (2.04 fold).

Table 5 Results of Anti-HBc serological profiles in related to risk factors

Factors related to risk for HBV infection	Number row (%)		Prevalence ratio	95 % CI
	Positive Anti-HBc	Negative Anti-HBc		
Blood transfusion				
• Yes (N = 8)	1 (12.5)	7 (87.5)	0.96	0.15 - 6.30
• No (N = 162)	21 (13.0)	141 (87.0)		
Intravenous injection				
• Yes (N = 1)	0 (0)	1 (100.0)	0	N/A
• No (N = 169)	22 (13.0)	147 (87.0)		
Ear piercing or tattooing				
• Yes (N = 73)	8 (11.0)	65 (89.0)	0.76	0.34 - 1.71
• No (N = 97)	14 (14.4)	83 (85.6)		
Unprotected sexual contact				
• Yes (N = 4)	2 (50.0)	2 (50.0)	4.15	1.43 - 12.01
• No (N = 166)	20 (12.0)	146 (88.0)		

Table 5 (Continued)

Factors related to risk for HBV infection	Number row (%)		Prevalence ratio	95 % CI
	Positive Anti-HBc	Negative Anti-HBc		
Exposure to dental environment without immunization				
• Yes (N = 56)	11 (19.6)	45 (80.4)	2.04	0.94 - 4.41
• No (N = 114)	11 (9.6)	103 (90.4)		
Mother to Child HBV transmission				
• Yes (N = 3)	2 (66.7)	1 (33.3)	5.57	2.26 - 13.69
• No (N = 167)	20 (12.0)	147 (88.0)		
HBV carrier in the family				
• Yes (N = 23)	7 (30.4)	16 (69.6)	2.98	1.36 - 6.52
• No (N = 147)	15 (10.2)	132 (89.8)		

Discussion

The prevalence of HBV infection among the sample in this study (positive to HBsAg) was 2.4 %. All of the participants who had chronic HBV infection were students. They reported no history of blood and secretion exposure before HBV serological profile screening in 2010. Therefore, they possibly contracted the virus from other sources. Regarding the Anti-HBs profile, the prevalence of HBV immunity in dental healthcare workers and students was 54.7 %. The number is similar to the data from previous studies in Thailand, which reported the prevalence rate of 48.3 - 69.5 %.^{12,13}

Several studies showed that healthcare workers such as doctors, nurses, pathologists and janitors, who have been exposed to blood and secretions, have a higher risk of HBV exposure than other occupations.¹³⁻¹⁵ We also found that the group that has been exposed to patients' blood and secretions had a greater risk of HBV exposure by 4.72 fold. Anti-HBc could be detected in 30.6 %, 22.2 % and 100 % of dental assistants,

laboratory workers, and janitor respectively. These data suggested that this group of people have a high risk of HBV exposure. Therefore, HBV vaccination consisting of a series of 3 injections is essential for healthcare workers. Also basic knowledge of the risks of transmission of HBV infection should be given to those who will be in contact with patient's blood and secretions. These precautions could help preventing HBV transmission to other healthcare workers, patients, friends and families.

Initial data from this study showed that some factors increase the risk of HBV exposure such as transmission from HBV infected mother (5.57 fold), unprotected sexual contact (4.15 fold), HBV carrier in the family (2.98 fold) and exposure to dental environment without immunization (2.04 fold). However, we cannot conclude that these risk factors were directly associated to risk of HBV exposure, as there were more variables that we did not control in this study. In addition to the exposure that the study was investigating, there may be other factors that are associated with the exposure and independently affects the risk of developing HBV infection.

If the prevalence of these other factors differs between groups being compared, they will mislead the observed association between the disease and exposure under the study.

Research shows that although 3 HBV vaccines have been given to the healthcare professionals, it is no guarantee that the person will respond to the vaccination as seroconversion rates of 90 % to 95 % have been reported for immunocompetent recipients of the HBV vaccine.^{16,17} Hence, the HBV serological screening should be performed before vaccination and also after the third injection for antibody formation. In the cases of non-responders, a fourth, fifth and sixth injection should be given.¹⁸ The pre-vaccination screening is performed to exclude people who have HBsAg and Anti-HBs positive from receiving vaccinations. Also the vaccinations will be given to those who have anti-HBs negative or antibody titre of less than 10 mIU/mL. There is also a recommendation for health care workers to have HBV screening profile every 5 years and receive boost injection when the immunity decreases.^{18,19}

Conclusion

Dental health care workers who had been exposed to patients' blood and secretions are at a higher risk of HBV infection than those who had not been exposed to patients' blood and secretions (4.72 fold). Pre-exposure hepatitis B vaccination is an essential strategy for preventing dental healthcare workers from occupational infection with HBV. In conclusion, dental professionals, dental students and dental auxiliaries should be aware of Hepatitis B infection, the hepatitis B vaccine and also the importance of HBV screening test before and after vaccination.

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