Seroprevalence and Risk Factors of Hepatitis B Virus Infection among Health Care Workers at the Institute of Neurology

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Objectives: *To define the seroepidemiology of Hepatitis B virus (HBV) infection among health care workers (HCWs) in the Institute of Neurology, and to evaluate the risk factors of HBV markers.*
Material and Method: *Blood samples were taken from 548 HCWs for HBV profiling (HBsAg, anti-HBs and anti-HBc) by Microparticle Enzyme Immunoassay (MEIA) methods. Questionnaires of demographics, type, and duration of work, history of blood exposure, HBV vaccination, and non-occupational risks of HBV infection were interviewed.*
Results: *Twenty-nine (5.3%) HCWs were HBsAg positive, 135 (24.6 %) had anti-HBc with anti-HBs suggesting immunity acquired from a previous HBV infection, 232 (42.3 %) had totally negative profiles, 40 (7.3 %) had anti-HBc only, 105 (19.2%) had protective levels of anti-HBs, 7 (1.3 %) had low anti-HBs levels. The significant risk factors included not having received the hepatitis B vaccine, male gender, past history of jaundice, viral hepatitis, family history of hepatoma, spouse with hepatitis B, and duration of employment in a clinical environment exceeding 5 years. No significant differences were found among HCWs regarding frequency of exposure to blood products.*
Conclusion: *Base on the significant risk factors of hepatitis B virus infection among HCWs, these findings will help implement effective measures aimed at preventing HBV infection.*

Keywords: *Hepatitis B virus, HBV markers , Health care workers (HCWs) , Seroprevalence, Risk factor*

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Hepatitis B virus (HBV) infection constitutes a public health problem with major impact in Southeast Asia including Thailand[1,2]. During the last 30 years, the seroprevalence of hepatitis B carriers in Thailand has amounted to approximately 6-10%[3,5].

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Due to occupational exposure, health care workers (HCWs) are at high risk of infection with HBV[6]. In many countries including Thailand, several studies have been conducted to elucidate hepatitis B epidemiology and risk factors among HCWs[7-14]. However, these studies were usually surveys performed at general rather than specialized hospitals as for example, the Institute of Neurology.

Vaccination is essential to protect HCWs from HBV infection[6]. A study has shown that upon intro-

duction of the vaccine, the prevalence of HBV infection among HCWs had declined[15,16]. In Thailand, after HBV vaccine had been administered to all newborns as part of Thailand's Expanded Program on Immunization (EPI) starting in 1985, a report demonstrated a steady decline of HBV infection among children since 1992[17,18]. However, data on seroepidemiology and risk factors among HCWs have remained limited.

The primary objective of the present study was to investigate seroepidemiology of Hepatitis B virus (HBV) infection among HCWs at the Institute of Neurology. An additional aim of the present study was identification of specific factors putting HCWs at risk of HBV infection.

Material and Method

Population study

The present study was conducted after receiving approval by the Ethics Committee of the Institute. Prior to enrolment, all participating HCWs gave their written informed consent.

The Prasat Institute of Neurology (PNI) is a government hospital located in Bangkok, Thailand. The hospital is administered by the Department of Medical Services, Ministry of Public Health and provides tertiary care services for patients of the departments of Neurosurgery, Neurology, Medicine, Neuroradiology, Rehabilitation, Ophthalmology, Psychiatry, and Dentistry. The hospital houses 350 beds and employs 919 HCWs. A review of previous hospital data on results of HBV profiles in patients who had undergone tests for HBV on doctor's orders between 2003 and 2004 showed the 36 out of 392 samples tested were HBsAg positive (unpublished data).

The HCW participants were asked to complete a questionnaire and offered HBV testing. The questionnaire was composed of six sections.

(1) Demographics, including age, sex, race, type of work, occupation, department**,** duration of employment in a clinical environment.

(2) HBV vaccination status, including history of vaccination, time since vaccination, location of injection, completion of vaccination course or booster.

(3) Risk of HBV infection outside workplace, such as transfusions, intravenous drug use, homosexual activity, and sexual contact with prostitutes.

(4) Past history of hepatitis, including history of jaundice, viral hepatitis or serological test results.

(5) Adherence to universal precaution, including frequency of exposure to sharp instruments per year.

(6) Family history of hepatitis, hepatoma, cirrhosis, and jaundice.

Occupational groups were classified according to frequency of exposure to blood/secretions and/or HBV infected patients. The high-risk group included physicians, dentists, nurses, laboratory technicians, patient assistants, and ward workers. The intermediate risk group comprised physical therapists, radiological teams, plumbers. The low-risk group included pharmacists, psychologists, social workers, electricians, general administrators, statisticians, librarians, nutritionists, health academicians, clerks, security guards and the public relations, finance, and audiovisual teams.

Table 1. Hepatitis B profiles classified by occupational risk groups

Groups	Hepatitis B profile results			Frequency number		Total (Percent)
	HBsAg	Anti-HBs	Anti-HBc	High risk	Intermediate and low risk	
1	Pos	Neg	Pos	20	7	27 (4.9)
2	Neg	≥ 10	Pos	96	39	135 (24.6)
3 & 4	Neg	Neg or < 10	Pos	24	16	40 (7.3)
5	Neg	≥ 10	Neg	81	24	105 (19.2)
6	Neg	< 10	Neg	4	3	7 (1.3)
7	Neg	Neg	Neg	178	54	232 (42.3)
8	Pos	Pos	Pos	1	0	1 (0.2)
9	Pos	Neg	Neg	0	1	1 (0.2)
Total				404	144	548 (100)

p = 0.172

Table 2. Risk factors contributing to hepatitis B carrier status among HCWs

Risk factors	HBsAg positive (%) n = 29	Non carrier (%) n = 519	p-value
Sex			0.025*
Male	9 (11.39%)	70 (88.61%)	
Female	20 (4.26%)	449 (95.74%)	
Age group (year)			0.128
≤ 30	2 (1.60%)	127 (99.40%)	
31-40	8 (5.41%)	140 (94.59%)	
41-50	12 (7.84%)	141 (92.16%)	
≥ 51	7 (5.93%)	111 (94.07%)	
Occupational Risk Groups			0.182
High risk	21 (5.20%)	383 (94.80%)	
Intermediate risk	3 (13.64%)	19 (83.36%)	
Low risk	5 (4.10%)	117 (95.90%)	
Working year			0.03*
5 years and below	2 (1.55%)	127 (98.45%)	
Above 5 years	27 (6.44%)	392 (93.56%)	
Marital status			0.779
Single	10 (4.76%)	200 (95.24%)	
Married	17 (5.9%)	271 (94.1%)	
Divorced/mid/separate	2 (4%)	48 (96%)	
Education			0.651
Undergraduate	13 (4.85%)	255 (95.15%)	
Postgraduate	16 (5.71%)	264 (94.29%)	
Blood exposure in 2 yr			0.865
At least 1 day/week or more	14 (5.24%)	253 (94.76%)	
At least 1 day/month or less	15 (5.58%)	254 (94.42%)	
Secretions exposure in 2 yr			0.921
At least 1 day/week or more	15 (5.42%)	262 (94.58%)	
At least 1 day/month or less	14 (5.22%)	254 (94.78%)	
History of vaccination			0.007*
Vaccinated	1 (0.83%)	120 (99.17%)	
Not vaccinated	25 (7.42%)	312 (92.58%)	
Not known	3 (3.33%)	87 (96.67%)	
History of jaundice			0.022*
Yes	4 (17.39%)	19 (82.61%)	
No	22 (4.4%)	478 (95.6%)	
Unknown	3 (12%)	22 (88%)	
History of viral hepatitis			0.001*
Yes	8 (29.63%)	19 (70.37%)	
No	18 (3.66%)	474 (96.34%)	
Unknown	3 (10.34%)	26 (89.66%)	

* $p < 0.05$

Serological testing

Blood samples of participating HCWs were drawn for HBV profiling by commercially available Microparticle Enzyme Immunoassay (MEIA) to determine hepatitis B surface antigen (HBsAg), antibody to hepatitis surface antigen (anti-HBs) and antibody to hepatitis B core antigen (anti-HBc) (Abbott Laboratory, North Chicago, IL). Anti-HBs levels $\geq$ 10 mIU/mL were defined as protective levels. The HBsAg positive test results were repeatedly confirmed.

Statistical analysis

Data were entered and validated using a customized program. The HBV profile was determined by laboratory test results at the final visit. The number of cases per HBV profile was counted and classified in relation to risk groups as determined by random occupational exposure. To analyze associations between the HBV profile and selected potential risk factors, the authors used the bivariate method. Potential risk factors included personal characteristics as well as occupational exposure factors. The authors determined statistical significance by Chi-square test and 95% CI. A p-value of less than 0.05 was considered statistically significant.

Results

Of altogether 919 HCWs, 548 participated in the present study during 2004-2005. All were Thai nationals, 79 (14.4%) were male and 469 (85.6%) female. Their age ranged between 20 and 61 years (mean 40.4 years) and the duration of their employment in a clinical environment between 1 and 41 years (mean 16.9 years). As shown in Table 1, the HBV profile of the HCW participants varied: 27 (4.9%) were HBsAg and anti-HBc positive, 135 (24.6 %) had anti-HBc with anti-HBs suggesting immunity acquired from a previous HBV infection, 40 (7.3 %) had anti-HBc only, 105 (19.2%) had protective levels of anti-HBs, 7 (1.3 %) had low anti-HBs levels, 232 (42.3 %) had totally negative profiles, 1 case (0.2%) had a completely positive hepatitis B profile and 1 case (0.2 %) was only HBsAg positive.

Comparison between HBsAg positive and negative groups did not yield any statistically significant differences between the respective risk groups such as those with different levels of occupational exposure, frequency of blood or secretion contact (Table 2). However, there were statistically significant differences as to sex (male: 11.39% vs. female: 4.26%, $p = 0.025$), duration of employment in a clinical environment (work $\leq$ 5 years: 1.55% vs. work > 5 years: 6.44%, $p = 0.03$), history of HBV vaccination (vaccinated: 0.83% vs. non-vaccinated: 7.42%, $p = 0.007$), history of jaundice (17.39% vs. 4.4%, $p = 0.022$), history of viral hepatitis (29.63% vs. 3.66%, $p = 0.001$). As for demographic data, neither age group ($p = 0.128$), marital status ($p = 0.779$) or education level ($p = 0.651$) were responsible for any statistically significant differences between both groups (Table 2).

Regarding the occupational risk groups, the authors found HBsAg positive markers in 5.20% of the high risk, 13.64% of the intermediate risk, and 4.10% of the low risk group (Table 2). The percentages of cases for each type of hepatitis B serological marker among 548 HCWs based on different occupational categories are shown in Table 3.

With respect to clinical department, prevalence of HBsAg-positive markers amounted to 1/9 (11.1%)

Table 3. The details of HBV markers among different HCW groups

Occupational groups	Hepatitis B profile group						Total
	Hepatitis B carrier	Natural immunity	Isolated anti-HBc	Protective anti-HBs	Anti-HBs < 10	Negative	
Physician	1 (8.33%)	3 (25%)	0	6 (50%)	0	2 (16.67%)	12
Dentist	0	2 (33.33%)	2 (33.33%)	1 (16.67%)	1 (16.67%)	0	6
Nurse	13 (7.1%)	42 (22.95%)	7 (3.83%)	38 (20.77%)	0	83 (45.35%)	183
Laboratory technician	1 (4.76%)	4 (19.05%)	1 (4.76%)	8 (38.10%)	0	7 (33.33%)	21
Patient assistant	5 (3.45%)	33 (22.76%)	9 (6.21%)	26 (17.93%)	2 (1.38%)	70 (48.27%)	145
Ward worker	1 (2.70%)	12 (32.43%)	5 (13.52%)	2 (5.41%)	1 (2.70%)	16 (43.24%)	37
Intermediate and low risk	8 (5.56%)	39 (27.08%)	16 (11.11%)	24 (16.67%)	3 (2.08%)	54 (37.5%)	144
Total	29	135	40	105	7	232	548

in pediatrics, 2/25 (8%) in ER/OPD, 13/184 (7.1%) in nursing, 1/16 (6.3%) in neurology, 1/17 (5.9%) in neurosurgery, 1/22 (4.5%) in pathology including laboratory, 1/24 (4.17%) in rehabilitation, and 9/202 (4.5%) in low risk departments, without statistically significant differences between the different departments (p = 0.948).

As for working history, 151 HCWs had had sharp injury, 24 and 40 HCWs had had eye mucous membrane exposure to blood and secretions, respectively. Comparison between HBsAg positive and negative groups did not yield any statistically significant differences as to history of sharp injury, eye membrane contact with blood, eye membrane contact with secretions.

Hepatitis B vaccination

One hundred and twenty-one (22.1%) HCWs reported prior HBV vaccination, 337 (61.5%) had not been vaccinated, and 90 (16.4%) were not sure of their vaccination history. Of the 105 HCWs, who were only anti-HBs positive at levels $\geq$ 10 mIU/mL, 80 had vaccination history, 14 had not been vaccinated, and 11 were not sure.

Of the 120 vaccinated HCWs in the non-carrier group, 83 had had one complete course of vaccine, 20 had had an incomplete course, two had received more than one course, and 13 did not know. Only one case who was an HBV carrier had a history of vaccination but did not know the dosage.

Table 4. Details of the family history of HCWs

Family history	Number of HBsAg+ (%) n = 29	Non carrier (%) n = 519	p-value
Hepatitis B			0.321
Yes	4 (9.76%)	37 (90.24%)	
No	21 (4.70%)	426 (95.30%)	
Unknown	4 (7.02%)	53 (92.98%)	
Hepatoma			0.019*
Yes	6 (12.77%)	41 (87.23%)	
No	19 (4.04%)	451 (95.96%)	
Unknown	4 (16%)	21 (84.00%)	
Cirrhosis			0.129
Yes	2 (8.70%)	21 (91.30%)	
No	23 (4.73%)	463 (95.27%)	
Unknown	4 (12.5%)	28 (87.50%)	
Jaundice			0.368
Yes	0	21 (100%)	
No	26 (5.33%)	462 (94.67%)	
Unknown	3 (8.82%)	31 (91.18%)	
Spouse had hepatitis B			0.048*
Yes	2 (18.18%)	9 (81.82%)	
No	26 (4.87%)	508 (95.13%)	
Unknown	1 (4.35%)	2 (95.65%)	

* $p < 0.05$

Family history

As to the family history of HCWs, hepatitis B had occurred in 41 (7.48%), hepatoma in 47 (8.58%), cirrhosis in 23 (4.20%), and jaundice in 21 (3.83%) families, respectively. Comparison between HBsAg positive and negative groups yielded statistically significant differences with respect to family history of hepatoma (12.77% vs. 4.04%, p = 0.019). In contrast, the authors did not find any statistically significant differences with respect to the family history of hepatitis B (9.76% vs. 4.70%, p = 0.321), cirrhosis (8.70% vs. 4.73%, p = 0.129), or jaundice (0% vs. 5.33%, p = 0.368) (Table 4).

Regarding the spouse's HBV status, comparison between HBsAg positive and negative groups showed statistically significant differences in those cases where positive HCWs had a spouse with a history of hepatitis B (18.18% vs. 4.87%, p = 0.048) (Table 4).

Personal history

There were no statistically significant differences between HBsAg positive and negative groups with respect to non-occupational personal risk factors such as homosexuality, IVDU, or sexual contact with prostitutes.

Forty-five HCWs had a history of blood transfusion, two had a disease requiring multiple transfusions but none of these yielded any statistically significant differences between the HBsAg positive and negative groups.

Anti-HBc

Comparison between the anti-HBc positive and negative groups yielded statistically significant differences with respect to sex, history of HBV vaccination, history of jaundice and history of viral hepatitis. These factors were similar to those found significantly associated with HBsAg positive subjects. However, contrasting the results the authors obtained regarding HBsAg, the number of anti-HBc positive subjects increased in direct relation to work years.

Discussion

In the present hospital-based study, HBV testing was offered to all participating HCWs. Among 548 participating HCWs, HBV carrier prevalence amounted to 5.29%; 316 subjects (57.66%) were positive for any marker, 241 (43.98%) and 203 (37.04%) were positive for anti-HBs and anti-HBc, respectively. This prevalence of HBsAg and anti-HBs rate is comparable to that established by other studies on HBV seroprevalence in the general Thai population during the same period which established the seropositive rates of HBsAg at 4% and anti-HBs at 41.6%; however, the anti-HBc positive rate of the general population amounted to 26.5% which is lower than the prevalence in the present study[18]. There have been some other studies on HBV prevalence among Thai HCWs especially prior to HBV vaccine integration into the national EPI. Accordingly, HBsAg prevalence among Thai HCWs ranged from 3- 7% as shown in Table 5.

In the present study, factors associated with HBV carriage included not having received the hepatitis B vaccine, male gender, past history of jaundice, viral hepatitis, family history of hepatoma and hepatitis B in a spouse, and duration of employment in a clinical environment above 5 years. Similar to many previous studies, HBsAg positive markers were frequently found among male subjects in Thailand[12,14,21] as well as in other countries[7,22-24]. Yet, this deviated from other studies conducted on HBsAg prevalence among HCWs in the USA[9,25] and on populations in the one-to-nine and 30-year-and-above age brackets in Bangkok[4] which did not detect any significant differences between HBsAg-positive markers in males and females.

As for the risk of occupational exposure, the authors found some significantly as well as not significantly associated factors, similar to those reported in other studies. For example, one case-control study comparing between 1179 HCWs and 1406 non-hospital personnel without previous exposure to patients or blood products did not find any significant difference in the frequencies of HBsAg between both groups[26]. However, the results of the present study were different from various studies conducted on HCWs in countries with low hepatitis B prevalence according to which the risk for HCWs to become HBV carriers was associated

Table 5. The studies related to HBV prevalence among health care workers in Thailand

Reference	No.	%HBsAg +ve	Hospital,population study	Results
Pongpipat et al, 1979[11]	486	7	Siriraj, Thai medical student	No significant difference in each 4 classes
Techapaitoon et al, 1985[12]	473	6.97	Samutprakan,HCWs	11.71% in male>5.52% in female, significant, higher HBsAg and anti-HBc prevalence in OR/ER
Wongpaitoon et al, 1986[13]	292	6.9	Ramathibodi, Payathai HCWs	HBsAg 6.9% in exposed vs. 5.1% in non-exposed
Khow-ean et al, 1988[19]	200	3-4	Songklanakarind paramedical, non-paramedical personnel	Not different between paramedics, non-paramedics (3% vs. 4%)
Chokbunyasit et al, 1995[20]	1,772	6.6	Maharaj Nakorn Chiangmai, nurse, aides, workers	All markers in workers were significant more common than other group,higher prevalence in ER, ICU, labor room, OPD
Luksamijarulkul et al, 2001[14]	380	3.42	Lerdsin hospital, personnel who had no history of HB vaccination and no history of jaundice prior to commencing work	Significant, risk factor included age > 30 years, male, working at risk ward, history of needle stick

with occupational exposure[10] as nurses[23,27], physicians[9,24], laboratory personnel[9,25,27], and dentists[24,28]. Furthermore, a previous study found a higher rate of HBV infection in surgical departments including neurosurgery than in non-surgical departments[7]. On a note of caution though, this particular study used anti-HBs as one of the serological markers, which according to the present standard, cannot be used because the only positive anti-HBs level would mostly be due to HBV vaccination.

Additionally, in contrast to the present study, some researchers found needle stick injury associated with prevalence of HBV seropositive markers[10,14,24,29].

As in the present study, several authors have determined that the prevalence increased in direct relation to duration of employment[8,10,20,22,23,25,29].

With respect to country of birth, hepatitis B prevalence varies between different countries[22,29,30] suggesting that each hospital should assess its own risk for HBV infection and that pre-vaccination serological testing is particularly worthwhile in hospitals having large numbers of foreign-born employees.

HBsAg positive markers were found to correlate with past transfusion in controls, but not in HCWS[26]. Similar to other studies, the present one also found history of past hepatitis associated with prevalence of hepatitis B infection[8-10]. Anti-HBs was reported to be twice as frequent in health personnel (16% vs. 8.7 %, $p < 0.001$) and correlated with past hepatitis in HCWs[26].

According to the present study, the prevalence among HCWs aged from 30 to 50 years and above was determined at 5.4% (age 31-40), 7.8% (age 41-50) and 5.9% (age > 50), which does not deviate much from the prevalence established within the same age brackets of the general Thai population.

The results of the present study, which indicate that hospital personnel are not at increased risk for contracting HBV infection but that this risk is rather associated with a family history of hepatoma, and not related to occupational exposure; this could possibly be explained by the predominant mode of HBV transmission to vary. High prevalence of infection seems to occur (1) either at, or shortly after birth, when newborn babies were exposed to the bloodstained secretions of carrier mothers, and (2) before starting school, when the child was part of an extended family, some of whom may be carriers of the virus[2] . Perinatal infection was the predominant mode of transmission in high-prevalence areas, whereas unprotected sexual intercourse and intravenous drug use in adults were the major routes of spread in low-prevalence areas[2,31] .

Similar to some previous studies, the authors also found not having received HBV vaccine to be associated with HBV infection[23] . In 1991, the Occupational Safety and Health Administration (OSHA) mandated that all HCWs with potential exposure to blood should receive hepatitis B vaccine. Vaccination is essential to protect HCWs from this infection[6,16]. Even though hepatitis B vaccination has been integrated into Thailand's EPI, it has only been administered to all newborns since 1992, but not retroactively to other generations. Consequently, since 1992 a decline in HBV infection in children has been reported in Thailand[17,18]. Yet, the seroprevalence of hepatitis B carriers in the present study as well as in the previous studies conducted on Thai HCWs[11-13] and on the general Thai population prior to EPI [1] has not yet declined. This may be due to the absence of the HB vaccination program aimed at adults at risk of HBV infection.

Since, based on the present study, the only preventable risk factor is related to vaccination, the current vaccination program should also include HCWs born prior to routine implementation of hepatitis B vaccination as part of Thailand's catch up program. As indicated in the present study, lower prevalence was found among those working in the health facilities for 5 years or less compared to those with a work history exceeding 5 years. Hence, the authors would suggest that in order to minimize the risk of infection, vaccination should be administered to HCWs at an early stage of their training or work. As vaccination is still the best preventive measure in the health facilities setting, it is recommended that the current vaccination program should also include HCWs born prior to routine implementation of hepatitis B vaccination as part of Thailand's catch up program.

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References

1. Sobeslavsky O. Prevalence of markers of hepatitis B virus infection in various countries: a WHO collaborative study. Bull World Health Organ 1980; 58: 621-8.
2. Gust ID. Epidemiology of hepatitis B infection in the Western Pacific and South East Asia. Gut 1996; 38(Suppl 2): S18-23.
3. Punyagupta S, Olson LC, Harinasuta U, Akarawong K, Varawidhya W. The epidemiology of hepatitis B antigen in a high prevalence area. Am J Epidemiol 1973; 97: 349-54.
4. Grossman RA, Benenson MW, Scott RM, Snitbhan R, Top FH Jr, Pantuwatana S. An epidemiologic study of hepatitis B virus in Bangkok, Thailand. Am J Epidemiol 1975; 101: 144-59.
5. Thongcharoen P, Panpatana P, Wasi C, Jatikavanich V, Chandanayingyong D, Yongchaiyud U, et al. The incidence of hepatitis B surface antigen in tropical infections and liver diseases in Thailand. J Med Assoc Thai 1976; 59: 546-9.
6. Sepkowitz KA. Nosocomial hepatitis and other infections transmitted by blood and blood products. In: Mandell GL, Bennett JE, Dolin R, editors. Principles and practice of infectious diseases. 5th ed. Philadelphia: Churchill Livingstone; 2000: 3039-52.
7. Janzen J, Tripatzis I, Wagner U, Schlieter M, Muller-Dethard E, Wolters E. Epidemiology of hepatitis B surface antigen (HBsAg) and antibody to HBsAg in hospital personnel. J Infect Dis 1978; 137: 261-5.
8. Dienstag JL, Ryan DM. Occupational exposure to hepatitis B virus in hospital personnel: infection or immunization? Am J Epidemiol 1982; 115: 26-39.
9. Snydman DR, Munoz A, Werner BG, Polk BF, Craven DE, Platt R, et al. A multivariate analysis of risk factors for hepatitis B virus infection among hospital employees screened for vaccination. Am J Epidemiol 1984; 120: 684-93.
10. Gibas A, Blewett DR, Schoenfeld DA, Dienstag JL. Prevalence and incidence of viral hepatitis in health workers in the prehepatitis B vaccination era. Am J Epidemiol 1992; 136: 603-10.
11. Pongpipat D, Suvatte V, Assateerawatts A. Prevalence of HBs Ag, e-antigen and anti-e among Thai medical students. J Med Assoc Thai 1979; 62: 26-33.
12. Techapaitoon S, Duangploy S, Powtongsook V. Hepatitis-B virus infection in hospital personnel: an epidemiological study. J Med Assoc Thai 1987; 70: 455-8.
13. Wongpaitoon V, Kurathong S, Pichayayothin N, Himathongkam T. Prevalence of hepatitis B virus markers in hospital personnel. J Med Assoc Thai 1986; 69: 525-34.
14. Luksamijarulkul P, Watagulsin P, Sujirarat D. Hepatitis B virus seroprevalence and risk assessment among personnel of a governmental hospital in Bangkok. Southeast Asian J Trop Med Public Health 2001; 32: 459-65.
15. Lanphear BP, Linnemann CC Jr, Cannon CG, DeRonde MM. Decline of clinical hepatitis B in workers at a general hospital: relation to increasing vaccine-induced immunity. Clin Infect Dis 1993; 16: 10-4.
16. Mahoney FJ, Stewart K, Hu H, Coleman P, Alter MJ. Progress toward the elimination of hepatitis B virus transmission among health care workers in the United States. Arch Intern Med 1997; 157: 2601-5.
17. Poovorawan Y, Theamboonlers A, Vimolket T, Sinlaparatsamee S, Chaiear K, Siraprapasiri T, et al. Impact of hepatitis B immunisation as part of the EPI. Vaccine 2000; 19: 943-9.
18. Chongsrisawat V, Yoocharoen P, Theamboonlers A, Tharmaphornpilas P, Warinsathien P, Sinlaparatsamee S, et al. Hepatitis B seroprevalence in Thailand: 12 years after hepatitis B vaccine integration into the national expanded programme on immunization. Trop Med Int Health 2006; 11: 1496-502.
19. Khow-ean U, Sukthomya V, Kuntangkul M. The prevalence of HBsAg carriers in paramedics and non-paramedics at Songklanagarind Hospital in southern part of Thailand. Songkla Med J 1988; 6: 258-61.
20. Chokbunyasit N, Potacharoen O, Sirisanthana T. Prevalence of HBV infection in nurses and manual workers in Maharaj Nakorn Chiang Mai Hospital. J Med Assoc Thai 1995; 78(Suppl 1): S19-25.
21. Pramoolsinsap C, Pukrittayakamee S, Desakorn V. Hepatitis B problem in Thailand. Southeast Asian J Trop Med Public Health 1986; 17: 219-28.
22. Hadler SC, Doto IL, Maynard JE, Smith J, Clark B, Mosley J, et al. Occupational risk of hepatitis B infection in hospital workers. Infect Control 1985; 6: 24-31.
23. Thomas DL, Factor SH, Kelen GD, Washington AS, Taylor E Jr, Quinn TC. Viral hepatitis in health care personnel at The Johns Hopkins Hospital. The seroprevalence of and risk factors for hepatitis B virus and hepatitis C virus infection. Arch

Intern Med 1993; 153: 1705-12.
24. Petrosillo N, Puro V, Ippolito G, Di N, V, Albertoni F, Chiaretti B, et al. Hepatitis B virus, hepatitis virus and human immunodeficiency virus infection in health care workers: a multiple regression analysis of risk factors. J Hosp Infect 1995; 30: 273-81.
25. Pattison CP, Maynard JE, Berquist DR, Webster HM. Epidemiology of hepatitis B in hospital personnel. Am J Epidemiol 1975; 101: 59-64.
26. Lewis TL, Alter HJ, Chalmers TC, Holland PV, Purcell RH, Alling DW, et al. A comparison of the frequency of hepatitis-B antigen and antibody in hospital and nonhospital personnel. N Engl J Med 1973; 289: 647-51.
27. Louther J, Feldman J, Rivera P, Villa N, DeHovitz J, Sepkowitz KA. Hepatitis B vaccination program at a New York City hospital: seroprevalence, seroconversion, and declination. Am J Infect Control 1998; 26: 423-7.
28. Shapiro CN. Occupational risk of infection with hepatitis B and hepatitis C virus. Surg Clin North Am 1995; 75: 1047-56.
29. Weiss Y, Rabinovitch M, Cahaner Y, Noy D, Siegman-Igra Y. Prevalence of hepatitis B virus markers among hospital personnel in Israel: correlation with some risk factors. J Hosp Infect 1994; 26: 211-8.
30. Kalish SB, Fisher B, Wallemark CB, Chmiel JS, Phair JP. Prevalence of antibody to hepatitis B virus in foreign-born hospital employees. Am J Med 1987; 83: 824-8.
31. Koziel MJ, Siddiqui A. Hepatitis B virus and hepatitis delta virus. In: Mandell GL, Bennett JE, Dolin R, editors. Principles and practice of infectious diseases. 6th ed. Philadelphia: Churchill Livingstone; 2005: 1864-90.

การศึกษาความชุกของการติดเชื้อไวรัสตับอักเสบบีและปัจจัยเสี่ยงในบุคลากรสถาบันประสาทวิทยา

สุภาวดี เจียรกุล, กฤษณา เอื้อน้อมจิตต์กุล, สุนันทา วุฒิโอภาส, อารีรัตน์ วรพิมล, จรณิต แก้วกังวาล, ยง ภู่รวรรณ

วัตถุประสงค์*: ศึกษาระบาดวิทยาของเชื้อไวรัสตับอักเสบบีในบุคลากรทางการแพทย์สถาบันประสาทวิทยา และปัจจัยเสี่ยงของการติดเชื้อไวรัสตับอักเสบบี*

วัสดุและวิธีการ*: ตรวจเลือดบุคลากรตรวจหาหลักฐานการติดเชื้อไวรัสตับอักเสบบี ได้แก่ HBsAg, anti-HBs and anti-HBc โดยวิธี ELISA และสัมภาษณ์ข้อมูลพื้นฐาน ลักษณะการปฏิบัติงาน ประวัติการสัมผัสเลือด/สารคัดหลั่ง การได้รับวัคซีน และพฤติกรรมเสี่ยง*

ผลการศึกษา*: บุคลากร 29 ราย จากทั้งหมดในการศึกษา 548 คน (ร้อยละ 5.3) เป็นพาหะไวรัสตับอักเสบบี, 135 ราย (ร้อยละ 24.6) มีภูมิคุ้มกันตามธรรมชาติ, 232 ราย (ร้อยละ 42.3) ไม่มีภูมิคุ้มกัน, 40 ราย (ร้อยละ 7.3) มี anti-HBc บวกอย่างเดียว, 105 ราย (ร้อยละ 19.2) มี anti-HBs ระดับสูงมากกว่า 10 mIU/mL, 7 ราย (ร้อยละ1.3) มี anti-HBs ระดับต่ำกว่า 10 mIU/mL ปัจจัยเสี่ยงของการเป็นพาหะไวรัสตับอักเสบบีประกอบด้วย ไม่เคยได้รับวัคซีนป้องกันไวรัสตับอักเสบบี เพศชาย เคยเป็นดีซ่านหรือไวรัสตับอักเสบ มีประวัติมะเร็งตับในครอบครัว มีคู่สมรสติดเชื้อไวรัสตับอักเสบบี และปฏิบัติงานในโรงพยาบาลเกิน 5 ปี ไม่พบความสัมพันธ์ในแต่ละกลุ่มอาชีพหรือหน่วยงานที่แยกตามความเสี่ยงของการสัมผัสเลือดหรือสารคัดหลั่ง*

สรุป*: ความชุกของการเป็นพาหะไวรัสตับอักเสบบีในบุคลากรสถาบันประสาทวิทยาพบ ร้อยละ 5.3 เมื่อประเมินปัจจัยเสี่ยง ข้อมูลดังกล่าวจะเป็นประโยชน์ใช้ในการวางแผนการป้องกันโรคไวรัสตับอักเสบบีในบุคลากรทางการแพทย์ต่อไป*