PREVALENCE OF HEPATITIS B AND C VIRUS INFECTION AMONG WORKING WOMEN IN BANGKOK

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Abstract. A small-scale seroepidemiological survey on hepatitis B and C virus infection was conducted in the vicinity of Bangkok, Thailand, in 1998. Adult women working in a health sciences institution were invited to participate in the study, and 52 subjects (19 to 57 years of age) volunteered to offer peripheral blood. They were non-smoking and non-habitually drinking, and about two thirds of the subjects were married. The sera from the blood samples were assayed for HBsAg, anti-HBs, anti-HBc, and anti-HCV positivities. The serum assay showed that none of the subjects was positive to HBsAg or anti-HCV, but a half of the subjects (50%) were either positive to anti-HBs, to anti-HBc or to the both, thus having experienced HBV infection in the past. The prevalence of the positivities was significantly higher among those at 35-57 years of age than those younger than 35 years. Comparison of the present findings with the results reported in literature suggested that the risk of HBV infection should have been higher than that of HCV infection, that the observed positivity of HBV infection was probably lower than ever reported, and that anti-HCV positivity should be the lowest.

INTRODUCTION

Infection at an earlier stage of life with hepatitis B and C viruses (to be abbreviated as HBV and HCV, respectively) is a risk factor of hepatocellular carcinoma (HCC) at the later stage (Szmuness 1978; Sobeslavsky 1980; Yuki *et al,* 1992; International Agency for Research on Cancer 1994; Okuno *et al,* 1994; Tsai *et al,* 1994; Di Bisceglie 1995; Mansell and Locarnini 1995). A 1980 report of a WHO collaborative study summarized that the prevalence of HBV infection was higher in Africa and Asia than in the Americas and northern and central Europe (Sobeslaosky 1980); in Bangkok, Thailand, for example, the prevalence of HBV carriers was reported to be about 9% among the adult populaion. Some 10 years later, Srivatanakul *et al* (1991a, b) also reported a similarly high prevalence of around 8.4% in serum samples collected in Bangkok and other cities, with 12.5% in Bangkok. Reports on the current situation after remarkable progress in the economy in 1990s are however scarce in internationally available journals.

A small-scale preliminary seroepidemiological survey was carried out by this study group in the vicinity of Bangkok on HBV infection prevalence. Prevalence of HCV infection was also surveyed in parallel.

MATERIALS AND METHODS

Study population and study design

A survey on seroepidemiology of HBV and HCV infection was conducted in February, 1998, in the very vicinity of Bangkok, Thailand. The small size of the survey, about 50 subjects only, was taken into consideration in the study design. Accordingly, only one sex (women) was selected to exclude possible confounding effects due to the sex difference in infection prevalence, because sex dif-

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ferences in prevalence of HBV antigen positivity (Sobeslavsky, 1980) and of HCC occurrence (Yuan *et al,* 1995) are known to exist.

Adult women serving in a non-clinical health sciences institution located near the border of the city in of Bangkok were invited to join the study, and 52 subjects (19 to 57 years of ages) accepted the invitation. In addition to offering blood samples from the cubital vein, they had a medical interview on history of major diseases, current social habits of smoking and alcohol intake, and marital status.

Assay for markers of hepatitis virus B and C infection, and liver function

Serum was separated on-site by centrifugation, and kept frozen until analyzed in a clinical laboratory Japan. Assays for HBV and HCV infection markers were by commercial RIA or EIA kits, *ie,* HBV surface antigen (HBsAg) by AUSRIA II-125, HBV surface antibody (anti-HBs) by AUSAB, HBV core antibody (anti-HBc) by RIAKIT, and HCV antibody (anti-HCV) by HCV EIA II (all from Abbott-Dianabott, Tokyo, Japan). The three serum enzymes of aspartate aminotransferase (ASAT: EC 2.6.1.1), alanine aminotransferase (ALAT: EC 2.6.1.2), γ-glutamyl transpeptidase (γ-GTP: EC 2.3.2.1) were assayed by conventional methods with a Hitachi 7350 autoanalyzer (Hitachi, Tokyo, Japan). Criteria for evaluation of the assay results are summarized in Table 1.

Statistical analysis

Serum enzyme activities were assumed to distribute lognormally, and geometric means (GMs) together with geometric standard deviations (GSDs) were calculated. Unpaired Student's *t*-test (after logarithmic conversion) and chi-square test were employed for detection of difference in means and prevalence, respectively.

RESULTS

Positivity to hepatitis virus infection markers

The medical interview revealed that the subjects were all nonsmokers, nonhabitual drinkers, and mostly married. It was also known that none of them was a professional blood donor.

The results of assays on HBV and HCV infection markers among the 52 subjects were classified by positivity to HBsAg, anti-HBs, anti-HBc and HCV (*ie,* $HBsAg^+$, $anti\text{-}HBs^+$, $anti\text{-}HBc^+$ and HCV^+, respectively) as summarized in Table 2; when the subject was positive to any of the three HBV infection markers, the case was defined as HBV-positive or HBV^+. It was found that none of the subjects was $HBsAg^+$, and that 20 and 13 subjects respectively were positive to either anti-HBs, or anti-HBc. Accordingly, 50% of the women were HBV^+ when positive and borderline cases were combined, indicating that a half of the subjects had experienced HBV infection in the past, although none of them was a HBV carrier at the time of the survey. In sharp contrast, none of the subjects showed positivity to anti-HCV.

The 52 subjects were classified by ages into the younger and older group of a similar size (*ie,* 31 and 21 subjects, respectively), taking 35 years as the point of division. Comparison of the positivity prevalence showed that both $anti\text{-}HBs^+$ and $anti\text{-}HBc^+$ prevalence were significantly ($p < 0.05$) different especially when the borderline-positive cases were combined with the positive cases. Resultingly, the prevalence of HBV^+ cases was significantly ($p < 0.01$) higher in the older group (15 cases out of 21, or 71%) than in the younger group (11 out of 31, or 35%).

Of the 52 subjects, 36 subjects lived in Bangkok or similarly urbanized Nonthaburi Province and remaining 16 were in less urbanized Nakhon Pathom or other provinces. Classification of the 26 HBV^+ (including borderline-positive) cases (*ie* 18 and 8 cases in the former and latter residential groups) followed by chi-square test showed no significant ($p > 0.05$) difference in the distribution. Similarly, the same test after classification of the HBV^+ cases by marital status (12 and 14 cases among 20 singles and 32 married, respectively) did not show any significant ($p > 0.05$) difference.

Possible increase in serum enzyme activities in association with positivity to HBV infection markers

When evaluated in references to the normal ranges, ASAT, ALAT and γ-GTP activities stayed unelevated in all subjects except that ALAT was

Table 1

Criteria for hepatitis B and C virus infection markers and serum enzymes.

Examination item	Unit	Criteria		
		Nagative	Borderline	Positive
Hepatitis B infection indicator				
HBsAg	Cut-off ratio	< 1	≥ 1 to < 5	≥ 5
Anti-HBs	Cut-off ratio	< 1	≥ 1 to < 2	≥ 2
Anti-HBc	Suppression	< 30%	≥ 30% to < 70%	≥70%
Hepatitis C infection indicator				
Anti-HCV	Cut-off index	< 1	—	≥ 1
Serum enzyme activity				
ASAT	IU/l	8-40[a]		
ALAT	IU/l	5-35[a]		
γ-GTP	IU/l	0-60[a]		

Abbreviations are:
HBsAg, HBV surface antigen; anti-HBs, HBV surface antibody; anti-HBC, HBV core antibody; anti-HCV, HCV antibody; ASAT, aspartate aminotransferase (EC 2.6.1.1); ALAT, alanine aminotransferase (EC 2.6.1.2); γ-GTP, γ-glutamyl transpeptidase (EC 2.3.2.1).
[a]A normal range.

Table 2

Prevalence of hepaitis B and C virus infection markers by age group.

Indicative of hepatitis virus infection	Age range (years)		
	Total	21-35	36-59
Total number of cases	52	31	21
Hepatitis B			
$HBsAg^+$	0 (0)	0 (0)	0 (0)
$Anti\text{-}HBs^+$	20 (2)	9 (0)	11* (2)$^{++}$
$Anti\text{-}HBc^+$	13 (3)	4 (2)	9**(1)$^{++}$
HBV^+	24 (2)	10 (1)	14**(1)$^{+++}$
Hepatitis C			
$Anti\text{-}HCV^+$	0 (0)	0 (0)	0 (0)

Abbreviations are as under Table 1.
Values are the number of positive cases (borderline cases in parentheses). Symbols (asterisks for positive cases, and daggers for the combination of positive cases and borderline-positive cases) show that the difference from the values for the 19-35 year-old group is statistically significant (* for $p < 0.10$, ** and ++ for $p < 0.05$, and +++ for $p < 0.01$, respectively).

Table 3
Serum enzyme activity by positivity to HBV infection markers.

HBV infection marker	Pos/neg	No. of cases	Serum enzyme activity (Unit; IU/l)		
			ASAT	ALAT	γ-GTP
Anti-HBs	Positive	20	14.6 (1.19)	8.8 (1.54)	10.6 (1.26)
	Negative[a]	32	15.4 (1.22)	8.7 (1.56)	9.9 (1.40)
Anti-HBc	Positive	13	14.9 (1.22)	8.5 (1.58)	10.0 (1.22)
	Negative	39	15.2 (1.21)	8.8 (1.56)	10.2 (1.39)
HBV	Positive	24	14.7 (1.19)	8.4 (1.57)	10.2 (1.26)
	Negative	28	15.5 (1.22)	9.1 (1.56)	10.2 (1.42)

Abbreviations are as under Table 1.
Unless otherwise specified, values are GM (GSD) of enzyme activity. There was no statistically significant difference between the positive and negative cases ($p > 0.10$).
[a] Including borderline cases.

Table 4

HBV and HCV infection prevalence among adult people reported in literature.

Reference	Prevalence (%) of infection marker					Remark on the study population
	HBsAg$^+$	anti-HBs$^+$	anti-HBc$^+$	HBV$^+$	anti-HCV$^+$	
Sobeslavsky (1980)	8.7	60.4				Men and women in Bangkok
Srivatanakul *et al* (1991a)	8.4				3.2	Men and women HCC controls[a]
Srivatanakul *et al* (1991b)	12.5			63.3		Controls to HCC cases in Bangkok
Laosombat *et al* (1997)					23.8	Thalassemic patients[b]
Songsivilai *et al* (1997)	4.9				5.6	Men and women in n.-e.[c] Thailand
Barusrux *et al* (1997)					4.3[d]	Men in n.-e.[c] Thailand
The present study	0.0	42.3	30.8	50.0	0.0	Women in Bangkok[e]

[a] Collected from Bangkok, Nakhon Ratchasima (Korat) and Ubon Ratchathani
[b] Thalassemic patients in southern Thailand with frequent blood transfusion.
[c] Northeastern Thailand.
[d] Calculated by the present authors.
[e] Including suburbs.

subclinically increased (38 IU/l) in a 33 year-old woman. She was however negaive to all HBV and HCV infection markers and her ASAT and γ-GTP levels stayed normal (25 and 21 IU/l, respectively).

Comparison on a group basis (Table 3) showed no significant difference ($p > 0.10$) in ASAT and ALAT activities between the anti-HBs, anti-HBc or HBV positive and negative groups. The same was also the case for γ-GTP levels.

DISCUSSION

The present study, although small in scale, made it clear that none of the study subjects had experienced HCV infection or was a HBV carrier, although the HBV^+ prevalence as a group was as high as 50% (Table 2). An age-dependent difference was significant in anti-HBs^+, anti-HBc^+ and also HBV^+ (Table 2). No residence-related difference was detected.

Several publications on HBV and HCV infection prevalence in Thailand (and in Bangkok in particular) were found in internationally available journals through literature retrieval for the period since 1980. They are summarized in Table 4. In a report on a WHO-organized world-wide collaborative study on HBV infection, Sobeslavsky (1980) commented that the population in Bangkok had $HBsAg^+$ and anti-HBs^+ prevlence of 9.3 and 42.4%, respectively. The subjects studied included young people at the ages of 19 years. Calculation of the prevalence in the adult population by excluding these young subjects gave $HBsAg^+$ and anti-HBs^+ prevalence of 8.7 and 60.4% respectively. No calculation for HBV^+ prevalence was possible because no other infection marker was studied. It should be noted however that the population from which the studied was drawn was a mixture of men and women, and the Communaity prevalence might be higher than that for women, because $HBsAg^+$ was reported to be higher for men than women in Bangkok at the time (Sobeslavsky, 1980).

HBV infection prevalence data were available in the articles by Srivatanakul *et al* (1991a, b) in which they studied non-HCC populations (assumedly healthy subjects) as the controls to HCC cases. In the first report, the control subjects (47 men and 18 women matched to the HCC cases) were collected from Korat (53 subjects) and Ubon Ratchathani (13 subjects) in addition to 7 from Bangkok. The $HBsAg^+$ prevalence (8.4%) reported in the first article (Srivatanakul *et al,* 1991a) was comparable to the value given by Sobeslavsky (1980), whereas the prevalence for HCV^+ was lower (3.2%). The control subjects (about 200 people/area) in the second article (Srivatanakul *et al,* 1991b) were from Bangkok (women by 50%) and other areas in Thailand (44-51%). The $HBsAg^+$ and HBV^+ prevalences among the control subjects from Bangkok were 12.5 and 63.3%, respectively, the former and the latter being the highest and the second highest among the five areas studied (*ie* 4.0-12.5% and 41.5-67.0%, respectively). Of particular interest is the observation that the ratio of those who were illiterate or with primary schooling only [lowest in Bangkok (16.8%) among the five areas (16.8-43.1%)] was not related to the HBV^+ prevalence. In a recent study on a very large population (>3,000 subjects) of voluntary blood donors in northeastern Thailand, Songsivilai *et al* (1997) found that the prevalences of HBsAg+ cases were 5.4% in men and 2.4% in women, or 4.9% when the two sexes were combined.

Regarding anti-HCV^+ prevalence, none of the 57 healthy HBV carriers and 32 health care workers (both in combination served as a control group to thalassemic patients) was HCV^+ in a study reported from Bangkok (Poovorawan *et al,* 1991). In contrast, Songsivilai *et al* (1997) reported a higher prevalence of HCV infection among >3,000 volunteer (unpaid) blood donors in northeastern Thailand; the ratio was 6.5% among men and 0.9% among women, or 5.6% for men and women in combination. In an even larger survey on >10,000 HIV-negative male volunteer blood donors in northeastern Thailand [where infection prevalence of human immunodeficiency virus (HIV) has been reported to be high], the HCV^+ prevalence was in a range of 1.8 to 8.6%, being variable depending on age ranges (Barusrux *et al,* 1997). Laosombat *et al* (1997) reported a high positivity ratio (>20%) among thalassemic patients in southern Thailand. This high prevalence cannot be extrapolated to the general population because the thalassemic patients had frequent blood transfusions and were thus exposed to a hight risk of infection (Botte and Janot, 1996).

The present study subjects were staff of a large non-clinical health sciences institution with high education. In addition, they should be more health-conscious than people in general, because of their occupation. In this sense, caution should be practiced when extrapolating the observed low prevalence especially of $HBsAg^+$ and anti-HCV^+ cases to the general population. Moreover, the study population all live in areas commutable to the institution and the lack of the effect of residence does not exclude the possibility of urban-rural difference in the prevalence. Nevertheless, it appears likely from this study that the risk of infection was higher from HBV than from HCV as the prevalence of anti-HCV^+ cases was 0% in contrast to 50% for

HBV^+, and the that HBV carrier prevalence nevertheless can be quite low in the selected population, although the risk of infection from HBV should be high in the past as high prevalence of anti-HBs^+ and/or anti-HBc^+ indicates. This conclusion is in support of the opinion of Songsivilai *et al* (1996) that HBV infection is a higher risk factor for HCC than HCV infection in Thailand.

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