SEROLOGICAL SURVEY OF VIRAL HEPATITIS A, B, AND C AT THAI CENTRAL REGION AND BANGKOK: A POPULATION BASE STUDY

Winai Ratanasuwan[1], Areeua Sonji[1], Surapee Tiengrim[2], Wichai Techasathit[1] and Surapol Suwanagool[1]

[1]Department of Preventive and Social Medicine, [2]Department of Medicine, Faculty of Medicine at Siriraj Hospital, Mahidol University, Bangkok, Thailand

Abstract. Hepatitis A, B, and C are important viral hepatitis infections in the Thai population. Hepatitis B vaccination was included in the Thai Expanded Program on Immunization (EPI) 10 years ago. In addition, the seroprevalence of hepatitis A has significantly changed in the last two decades. This study was done to evaluate current risk groups for hepatitis A and B infections and identify the magnitude of hepatitis C infection in the general population of Bangkok and six provinces in the Central Region of Thailand, during the period October 2000 to January 2002. This study revealed that the prevalence of anti-HAV in people younger than 25 years was low but very high in people older than 25 years. The prevalence of anti-HAV was1.95% in Bangkok and 12.7% in other provinces in people younger than 25 years ($p<0.001$) while 90.9% in Bangkok and 88.2% in other provinces among people older than 25 years. Therefore, people who are older than 25 years should have a blood test for anti-HAV before getting a hepatitis A vaccination. Approximately 80% of people who are not covered by hepatitis B vaccination from EPI are at risk of hepatitis B infection and its complications. This group of people should receive hepatitis B vaccination. For hepatitis C, the prevalence is lower than 2% across age groups and areas. Therefore, current good primary prevention via blood donor screening and health education must be maintained.

INTRODUCTION

Currently, many hepatitis viruses are transmitted among humans in the world. Three important hepatitis viruses are hepatitis A, B, and C. Chronic hepatitis B and hepatitis C are important risk factors for hepatocellular carcinoma (Poovorawan *et al*, 1998; Tangkijvanich *et al*, 1999). Hepatitis B is prevalent in Sub-saharan Africa and Southeast Asia. Although there is no preventive vaccine for hepatitis C, an effective vaccine for hepatitis B is available. Hepatitis B vaccine has been incorporated into the national immunization program for every Thai new-born since 1992 (Poovorawan *et al*, 2000), but people born before 1992 were not included in this program. Some of these people may get natural hepatitis B infection and have immunity, some may turn into chronic carriers, and some are naïve and susceptible to hepatitis B infection. Although there is no effective vaccine to prevent hepatitis C infection, the pattern of seroprevalence across age groups in general population is important for designing a strategic plan for public health, to control this infection and its sequela, hepatocellular carcinoma. Although hepatitis A has no chronic infection nor sequelae, it can cause periodic outbreaks (Sinlaparatsamee *et al*, 1995). There is effective vaccine to prevent hepatitis A, but it is expensive. People at risk of hepatitis A infection have significantly changed in recent years (Poovorawan *et al*, 1991; 1997a,b; Kunasol *et al*, 1998). Some studies have been conducted into the prevalence of hepatitis A, B, and C in Thailand, but most were done with specific groups of people (Chainuvati *et al*, 1991; Suwanagool *et al*, 1995; Poovorawan *et al*, 1997a,b). Identification of the group of people at risk of preventable diseases is important. This study was performed to identify the seroprevalence of hepatitis A, B, and C viruses in the general population, among various age groups, in Bangkok, and six prov-

Correspondence: Winai Ratanasuwan, Department of Preventive and Social Medicine, Faculty of Medicine at Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

inces in the Central Region of Thailand.

MATERIALS AND METHODS

The study protocol was approved by the Ethics Committee, Ministry of Public Health, Thailand. The study was performed during the period October 2000-January 2002. Six provinces in the Central Region were randomly selected: Nakhon Pathom, Kanchanaburi, Petchaburi, Ratchaburi, Prachuab Khiri Khan, and Suphanburi. Approximately 200 subjects of various age groups were randomly selected from each province by multistage stratified randomization method. After they or their legal representatives learned all details of the study and signed informed consent, 7 ml of blood was collected for serology testing for hepatitis A, B, and C. Demographic data and any history of hepatitis A and B immunization were collected from each patient. Sera were separated by centrifugation and kept at -20ºC until tested. Each sample was tested for hepatitis A antibody by ELISA technique (HAVAB^R EIA, Abbott Diagnostic, Abbott Park, IL, USA), hepatitis B surface antigen by ELISA technique (AUSZyme^R Monoclonal, Abbott Diagnostic, Abbott Park, IL, USA), hepatitis B surface antibody by ELISA technique (AUSAB^R EIA, Abbott Diagnostic, Abbott Park, IL, USA), and hepatitis C antibody by ELISA technique (Abbott HCV EIA 3.0, Abbott Diagnostics, Abbott Park, IL, USA).

RESULTS

A multistage and stratified sampling method was used to select samples in 4 age groups (< 13, 13-25, 26-60, and >60 years); approximately 50-90 cases per age group per province, were selected. Children under 13 years in this study were mostly aged 10-12 years, because more than 50% of the parents of children under 10 years did not agree to participate in the study. They refused because their children cried and they did not want to bother them.

The prevalence of hepatitis A antibody (anti-HAV) in children younger than 13 years ranged from 0%-28.13% (mean 6.4%). The prevalence of anti HAV was zero in this age group in 4 provinces: Bangkok, Nakhon Pathom, Ratchaburi, and Petchaburi. The prevalence of anti-HAV among the age group 13-25 years was 3.51%-29.63% (mean 14.9%), among the age group 26-60 years 61.54%-93.48% (mean 84.2%), and among the age group >60 years old it rose to 83.72%-98.33% (mean 94.7%). (Table 1).

In this study, the prevalence of hepatitis A in children under 13 years in provinces in the Central Region of Thailand was higher than the same age group in Bangkok (7.6% *vs* 0%, p<0.05). The prevalence of hepatitis A in children aged 13-25 years in provinces in the Central Region of Thailand was also higher than the same age group in Bangkok (16.3% *vs* 3.51%, p<0.05). However, the prevalence of hepatitis A in people aged 26-60 years and >60 years in provinces in the Central Region of Thailand was similar to the same

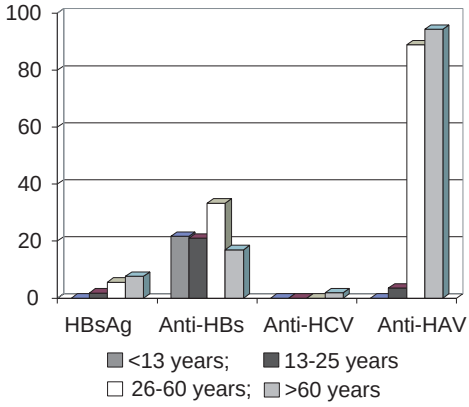

Fig 1–Seroprevalence of hepatitis A, B, and C among various age groups of subjects from Bangkok.

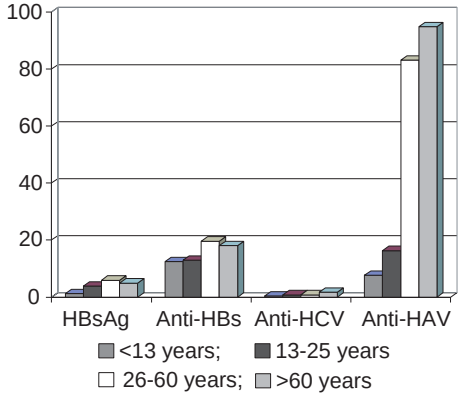

Fig 2–Seroprevalence of hepatitis A, B, and C among various age groups of subjects from Central Region 7.

Table 1
Seroprevalence of hepatitis A,B, and C among various age groups from each province.

Province	Age (years)	Number	HBsAg (%)	Anti-HBs (%)	Anti-HCV (%)	Anti-HAV (%)
Bangkok	<13	46	0 (0)	10 (21.74)	0 (0)	0 (0)
	13-25	57	1 (1.75)	12 (21.05)	0 (0)	2 (3.51)
	26-60	90	5 (5.56)	30 (33.33)	0 (0)	80 (88.89)
	>60	53	4 (7.55)	9 (16.98)	1 (1.89)	50 (94.34)
Kanchanaburi	<13	32	2 (6.25)	2 (6.25)	1 (3.13)	9 (28.13)
	13-25	62	2 (3.23)	2 (3.23)	1 (1.61)	8 (12.90)
	26-60	92	8 (8.70)	23 (25.00)	0 (0)	86 (93.48)
	>60	60	3 (5.00)	10 (16.67)	3 (5.00)	59 98.33)
Nakhon Pathom	<13	48	0 (0)	1 (2.08)	0 (0)	0 (0)
	13-25	50	3 (6.00)	4 (8.00)	0 (0)	2 (4.00)
	26-60	52	0 (0)	13 (25.00)	1 (1.92)	32 (61.54)
	>60	35	4 (11.43)	7 (20.00)	1 (2.86)	31 (88.57)
Prachuab Kiri Khan	<13	42	0 (0)	13 (30.95)	0 (0)	9 (21.43)
	13-25	54	1 (1.85)	19 (35.19)	0 (0)	16 (29.63)
	26-60	60	5 (8.33)	10 (16.67)	1 (1.67)	50 (83.33)
	>60	43	2 (4.65)	5 (11.63)	0 (0)	36 (83.72)
Ratchaburi	<13	41	0 (0)	11 (26.83)	0 (0)	0 (0)
	13-25	92	5 (5.43)	10 (10.87)	0 (0)	12 (13.04)
	26-60	60	2 (3.33)	16 (26.67)	1 (1.67)	50 (83.33)
	>60	51	3 (5.88)	10 (19.61)	1 (1.96)	50 (98.04)
Suphan Buri	<13	49	1 (2.04)	3 (6.12)	0 (0)	1 (2.04)
	13-25	50	1 (2.00)	5 (10.00)	1 (2.00)	10 (20.00)
	26-60	61	3 (4.92)	17 (27.87)	0 (0)	51 (83.61)
	>60	39	1 (2.56)	8 (20.51)	0 (0)	38 (97.44)
Phetchaburi	<13	38	0 (0)	1 (2.63)	0 (0)	0 (0)
	13-25	50	2 (4.00)	6 (12.00)	1 (2.00)	10 (20.00)
	26-60	48	4 (8.33)	7 (14.58)	0 (0)	41 (85.42)
	>60	59	1 (1.69)	12 (20.34)	0 (0)	58 (98.31)

age group in Bangkok (83.1% *vs* 88.89%, and 94.8% *vs* 94.3% respectively) (Figs 1, 2).

The prevalence of hepatitis B surface antigen (HBsAg) in children who are younger than 13 years old ranged from 0%-6.25% (mean 1.0%). The prevalence of HBsAg was zero in this age group in 5 provinces: Bangkok, Nakhon Pathom, Ratchaburi, Prachuab Kiri Khan, and Petchaburi. The prevalence of HBsAg among the age group 13-25 years was 1.75%-6.0% (mean 3.6%), among the age group 26-60 years 0%-8.7% (mean 5.8%), and among the age group >60 years, 1.69%-11.43% (mean 5.3%) (Table 1).

The prevalence of hepatitis B carrier (HBsAg) in children under 13 years in Bangkok was not significantly lower than the same age group from other provinces (0% *vs* 1.2%, p> 0.25); the prevalence in children aged 13 to 25 years in Bangkok was not significantly lower than the same age group from other provinces (1.75% *vs* 3.9%, p>0.25); the prevalence among people >26 years in Bangkok was not significantly different from the same age group from other provinces (6.3% *vs* 5.45%) (Figs 1,2).

The prevalence of hepatitis B surface antibody (anti-HBs) in children younger than 13 years ranged from 2.08%-30.95% (mean 13.9%). The prevalence of anti-HBs among the age group 13-25 years rose to 3.23%-35.19% (mean 14.0%); among the age group 26-60 years old it was 14.58%-33.33% (mean 25.1%), and among the age group >60 years it was 11.63%-20.51% (mean 17.9%) (Table 1).

The prevalence of anti-HBs in subjects from age group <13 years, 13-25 years, and 26-60 years from Bangkok were not significantly higher than the same age groups from other provinces (21.7% *vs* 12.4%,p=0.08; 21.15 *vs* 12.9%, p=0.1; and 33.33% *vs* 19.6%, p=0.1 respectively), but there was a trend of higher immunity among people from Bangkok compared with subjects from other provinces (Figs 1, 2).

The prevalence of hepatitis C was very low across all age groups in all 7 provinces. The prevalence of hepatitis C antibody (anti-HCV) in children <13 years old ranged from 0%-3.13% (mean 0.3%), among the age group 13-25 years ranged from 0%-2.0% (mean 0.7%), among the age group 26-60 years old 0%-1.92% (mean 0.6%), and among the age group >60 years it rose to 0%-5.0% (mean 1.8%) (Table 1) (Figs 1, 2).

DISCUSSION

The prevalence of anti-HAV is increasing with age, both in Bangkok and other provinces in the Central Region of Thailand. The prevalence of hepatitis A in children under 13 years in Bangkok was zero in this study, while that in subjects aged 13-25 was 3.5%. This finding was much lower than previous studies. The prevalence of hepatitis A among medical students aged 20-22 years at Chulalongkorn University was 73.01% in 1981, 30.23% in 1992, 16.67% in 1996, and 6.67% in 2001 (Chatchatee *et al*, 2002).

Although the trend of natural seroconversion of hepatitis A is likely to change in future, the seroprevalence findings for hepatitis A in this study suggest that most people older than 25 years, both in Bangkok and rural areas, are currently safe from hepatitis A infection. If people >25 years request hepatitis A vaccination, the physician should test for anti-HAV before giving vaccine. Since the clinical course of hepatitis A is not severe in children, and the cost of hepatitis A vaccine is still high, universal coverage with hepatitis A vaccine for all Thai children may not now be cost-effective. However, it may be cost-effective in the future, if the cost of hepatitis A vaccine decreases.

The prevalence of hepatitis B carrier (HBsAg) found in children <13 years and in the age group 13-25 years, in Bangkok, was not significantly different from the same age group from other provinces, while the sample size was not large enough to detect any difference.

The prevalence of anti-HBs in children under 13 years in this study mostly represented children who were 10-12 years. Children under 10 years are now covered by the national immunization program, which includes hepatitis B vaccine. In addition, studies showed that the coverage of hepatitis B vaccine from provinces representing 4 regions of Thailand was good (average 82.3%) (Kalayanarooj *et al*, 1996; Chunsuttiwat *et al*, 1997; Chub-uppakarn *et al*, 1998). Therefore, the prevalence of anti-HBs in the children aged 10-13 years in this study would represent mostly natural antibody to hepatitis B virus. Children in this age group who are sero-negative for anti-HBs would be good candidates for hepatitis B vaccination.

People who were sexually active (aged between 13-60 years) in Bangkok had a higher prevalence of anti-HBs than people in the same age group in provinces other than Bangkok (28.6% *vs* 16.3%, p<0.001), from higher percentages of self-funded immunization. Although the prevalence of hepatitis B carrier in subjects <25 years old in Bangkok was not significantly lower than subjects in the same age group from other provinces (0% *vs* 1.2%, p>0.25), there was a trend of lower prevalence of hepatitis B carrier among this age group in Bangkok, compared with other provinces. People in this age group were mostly descendants of subjects in the first group. It may be inferred that the higher prevalence of hepatitis B immunity among people of sexually active age may reduce the prevalence of new hepatitis B carriers in the community. Therefore, people of sexually active age who are naïve to hepatitis B infection are a high priority for hepatitis B immunization if the government has a limited budget.

The prevalence of anti-HBs in subjects >60 years from Bangkok was similar to subjects from the same age group from other provinces. The prevalence of anti-HBs in this age group was mostly naturally acquired, therefore the prevalence is similar for any province.

The seroprevalence of hepatitis C was quite low across all age groups and areas. The highest

prevalence was found in subjects who were >60 years (1.75% from Bangkok and 1.89% from other provinces). This is good in public health terms because no effective hepatitis C vaccine is yet available and it may be inferred that current strategies of primary prevention for hepatitis C by blood donor screening and health education are working well and must be maintained.

In conclusion, the seroprevalence of hepatitis A was low in subjects <25 years, but very high in subjects >25 years. Therefore, screening for anti-HAV should be done before giving hepatitis A vaccinations to people >25 years old. Approximately 80% of people who are not covered by the national program for immunization are susceptible to hepatitis B infection and its long-term complications. Public health authorities should consider hepatitis B vaccination for these susceptible people. The prevalence of hepatitis C is low in the general population and this low prevalence should be maintained for as long as possible by strengthening preventive measures, such as blood donor screening, and reducing intravenous drug use.

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