

THE DECLINING PATTERN OF SEROEPIDEMIOLOGY OF HEPATITIS A VIRUS INFECTION AMONG ADOLESCENTS IN BANGKOK, THAILAND

Yong Poovorawan, Thosporn Vimolkej, Voranush Chongsrisawat, Apiradee Theamboonlers and Saowani Chumdermpadetsuk

Viral Hepatitis Research Unit, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand

Abstract. Hepatitis A virus (HAV) is a health problem in countries where seroepidemiology shows changes from hyperendemicity to intermediate endemicity. Throughout the last decade, we studied, in Bangkok, the seroprevalence of hepatitis A virus antibody (anti-HAV) among adolescents of different age groups. In 1996, 245 serum specimens from children aged between 10 and 19 were tested for anti-HAV by ELISA method. The results were compared to those obtained in 1987 and 1993 from students of the same age and attending the same school. Anti-HAV was detected in 31.4%, 14.6% and 12.7% of school children in the years 1987, 1993 and 1996, respectively. Each year, it was found that an increasing prevalence of anti-HAV was related to an increasing age. From 1987 to 1996, the age specific prevalence of anti-HAV was markedly decreased in younger children. The surveillance of the epidemiological trend of HAV infection is important for implementing preventive measures and for controlling the disease.

INTRODUCTION

Hepatitis A virus (HAV) is a small, 27 nm cubic symmetrical RNA picornavirus (type 72) (Feinstone *et al*, 1973). Only one serotype has been identified. However, there are some differences of the cloned genomes among isolates from different parts of the world (Robertson *et al*, 1991).

The prevalence of hepatitis A virus infection is related to standards of hygiene and socio-economic conditions of a community. HAV infection is transmitted from person to person by the fecal-oral route. Improvements in public hygiene and higher socio-economic level are associated with declining prevalence of this infection (Hadler, 1991). HAV infection in early childhood is usually subclinical, while symptomatic hepatitis A infection occurs with increasing age (Benenson *et al*, 1980; Hadler *et al*, 1980).

HAV infection is a major cause of viral hepatitis in Thailand. It caused 69% of acute viral hepatitis in children aged less than 15 years (Poovorawan *et al*, 1987 a, b). In the previous two decades, a large amount of Thai children were seropositive for HAV (Burke *et al*, 1981; Echeverria *et al*, 1983). For the last ten years, the socio-economic situation has much improved as a newly industrialized country. The seroprevalence of hepatitis A virus infection

has changed from hyperendemic into intermediate endemic status (Innis *et al*, 1991; Poovorawan *et al*, 1993). Increasingly susceptible adolescents and young adults contribute to sporadic symptomatic hepatitis A disease, particularly in high school children, communities and among factory workers.

The aim of this paper is to compare the age specific anti-HAV prevalence of hepatitis A virus infection among the secondary school students of the same school in Bangkok in different periods of time during the last decade.

MATERIALS AND METHODS

Study population

Three sets of serum samples were obtained for seroepidemiological study in 1987 (Poovorawan *et al*, 1988), prevaccination screening for a clinical trial with hepatitis A vaccine in 1993 (Poovorawan *et al*, 1996) and in 1996 from students (10-19 years old) who attended Wat Sungwej School in central Bangkok. All students in this study were of middle socio-economic class by income level. None of the students had been vaccinated with hepatitis A vaccine before the screening. For the purpose of the studies informed and written consent was obtained from their parents.

Serology

All serum samples were stored at -20°C until tested. Anti-HAV was detected by ELISA method. We used micro ELISA (Organon Teknika BV, Boxtel, Holland) for testing specimens in the year 1987 and commercially available HAVAB, EIA kit (Abbott Laboratories, North Chicago, Illinois) for the last two sets of specimens in the years 1993 and 1996.

RESULTS

One hundred and seventy-two, 253 and 254 sera specimens were collected from secondary school children in the years 1987, 1993 and 1996, respectively. The number of children, sex and sex ratio are shown in Table 1. The overall seroprevalence of anti-HAV markedly declined from 31.4% in 1987 to 14.6% in 1993 and 12.7% in 1996. The

Table 1

Number, sex and sex ratio of secondary school children among the three sets of studied groups in 1987, 1993 and 1996.

Year	No.	Male	Female	M:F
1987	172	43	129	1:3
1993	253	64	189	1:3
1996	245	41	204	1:5

comparison of age specific prevalence among the 3 groups at the same school during the different periods of time are shown in Table 2. The percentage of anti-HAV steadily increased with advancing age (Fig 1).

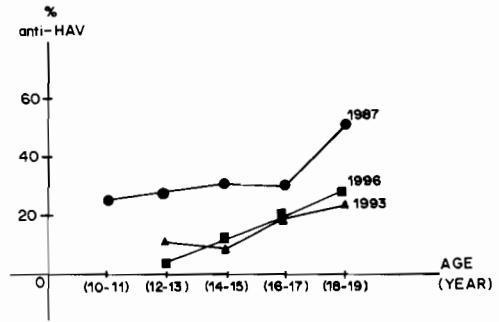


Fig 1- Comparison of age specific prevalence of anti-HAV among secondary school children of the same school during ten years.

DISCUSSION

Thailand had been an area with hyperendemicity for HAV infection until 15 years ago. In the past two decades, socio-economic conditions have changed, especially in Bangkok. According to the statistics in 1996, the GNP per capita increased from US\$ 560 in 1980 to US\$ 2,700 in 1995. The

Table 2

Age specific prevalence of anti-HAV among secondary school children in Bangkok in 1987; 1993 and 1996.

Age gr (year)	Year								
	1987			1993			1996		
	No	anti-HAV+ve No.	(%)	No.	anti-HAV+ve No.	(%)	No.	anti-HAV+ve No.	(%)
10-11	4	1	25	0	-	-	0	-	-
12-13	44	12	27.3	36	4	11.1	48	2	4.2
14-15	58	18	31	84	7	8.3	118	13	11
16-17	50	15	30	94	17	18.1	65	12	18.5
18-19	16	8	50	39	9	23.1	14	4	28.6
Total	172	54	31.4	253	37	14.6	245	31	12.7

improvement in socio-economic status leads to better living standard hygiene and education among the people. Similar situations occur in other newly industrialized countries such as Taiwan, Singapore. The prevalence of hepatitis A virus infection has changed from hyperendemic to intermediate endemicity (Wu *et al*, 1993; Yap and Guan, 1993). In this study, we compared the seroepidemiology of hepatitis A virus in the same school over 10 years. The data showed significantly declining seropositive teenage children aged 10-19 years from 31.4% to 12.7%. Hepatitis A viral infection is usually subclinical in childhood but the severity of the illness increases with age (Benenson *et al*, 1980; Hadler *et al*, 1980). The declining prevalence of naturally acquired immunity to HAV among adolescents may result in a greater number of cases of clinical infection. The large group of population in Bangkok less than 19 years old are susceptible to HAV infection which could result in an epidemic such as the outbreak in Shanghai, China in 1987 (Halliday *et al*, 1991; Yao, 1991). Prevention of outbreaks by improvements in the water supply, sanitary conditions and personal hygiene are essential. A vaccination program also plays role in epidemic prevention. Children, including adolescents, medical staff, travellers and military assigned to endemic areas as well as workers handling feces are candidates for hepatitis A vaccines. Inactivated vaccines have been prepared from cultures of HAV adapted in human fibroblasts and inactivated by formalin. The vaccines are safe, immunogenic and of highly protective efficacy (Werzberger *et al*, 1993; Innis *et al*, 1994). Results of a controlled field trial study in Thailand involving nearly 40,000 volunteer children showed an immune response and efficacy over 94% (Innis *et al*, 1994). Therefore the cost effectiveness for vaccination program against HAV infection should be studied in order to provide a proper preventive measure plan in the future.

ACKNOWLEDGEMENTS

We would like to thank the entire staff of the Viral Hepatitis Research Unit, Department of Pediatrics, Faculty of Medicine, Chulalongkorn University for their assistance. This study was supported by Rajadapiseksompoj fund, Faculty of Medicine, Chulalongkorn University and Smith-Kline Biologicals, Belgium. We also thank Sheila Cattell for reviewing the manuscript.

REFERENCES

- Benenson MW, Takafuji ET, Bancroft WH, Lemon SM, Callahan MC, Leach DA. A military community outbreak of hepatitis type A related to transmission in a child care facility. *Am J Epidemiol* 1980; 112 : 471-81.
- Burke DS, Snitbhan R, Johnson DE, Scott RM. Age specific prevalence of hepatitis A virus antibody in Thailand. *Am J Epidemiol* 1981; 113 : 245-59.
- Feinstone SM, Kapikian AZ, Purcell RH. Hepatitis A : Detection by immune electron microscopy of a virus like antigen associated with acute illness. *Science* 1973; 182 : 1026-8.
- Hadler SC, Webster RN, Erben JJ, Swanson JE, Maynard JE. Hepatitis A in day-care center. A community-wide assessment. *N Engl J Med* 1980; 302 : 1222-27.
- Hadler SC. Global impact of hepatitis A virus infection changing patterns. In : Hollinger FB, Lemon SM, Margolis HS, eds. Proceedings of the 1990 International Symposium on Viral Hepatitis and Liver Disease. Baltimore : Williams and Wilkins, 1991; 14-20.
- Halliday ML, Kang LY, Zhou TK, *et al*. An epidemic of hepatitis A attributable to the ingestion of raw clams in Shanghai, China. *J Infect Dis* 1991; 164 : 852-9.
- Innis B, Snitbhan R, Hoke CH, Munindhorn W, Laorakpongse T. The declining transmission of hepatitis A in Thailand. *J Infect Dis* 1991; 163 : 989-95.
- Innis BL, Snitbhan R, Kunasol P, *et al*. Protection against hepatitis A by an inactivated vaccine. *JAMA* 1994; 271 : 1328-34.
- Poovorawan Y, Sakulramrung R, Chumdermpadetsuk S. The etiology and clinical course of acute viral hepatitis in children. In : International Tropical Pediatrics. (Abstract). Bangkok, November 10-12 1987a.
- Poovorawan Y, Theamboonlers A, Pongpunlert W, Sakulramrung R, Chumdermpadetsuk S. Hepatitis A antibody in secondary school children in Bangkok. *Siriraj Hosp Gaz* 1987b; 40 : 219-23.
- Poovorawan Y, Theamboonlers A, Chumdermpadetsuk S. Changing seroepidemiology of hepatitis A virus infection in Thailand. *Southeast Asian J Trop Med Public Health* 1993; 24 : 250-4.
- Poovorawan Y, Theamboonlers A, Safary A. Single-dose hepatitis A vaccination : comparison of different dose levels in adolescents. *Vaccine* 1996; 14 : 1092-4.

HEPATITIS A IN THAILAND

- Robertson BH, Khanna B, Nainan, OV, Margolis HS. Epidemiologic patterns of wild-type hepatitis A virus determined by genetic variation. *J Infect Dis* 1991; 163 : 286-92.
- Werzberger A, Mensch B, Kuter B, *et al.* A controlled trial of a formalin-inactivated hepatitis A vaccine in healthy children. *N Engl J Med* 1993; 372 : 453-7.
- Wu JS, Lu CF, Wu LZ, *et al.* Changing seroepidemiology of hepatitis A virus infection between two regions in Taiwan differing in socioeconomic status. *J Formosa Med Assoc* 1993; 92 : 812-5.
- Yao G. Clinical spectrum and natural history of viral hepatitis A in a 1987 Shanghai epidemic. In : Hollinger FB, Lemon SM, Margolis HS, eds. Proceedings of the 1990 International Symposium of Viral Hepatitis and Liver Disease. Baltimore: Willams and Wilkins, 1991; 76-8.
- Yap I, Guan R. Hepatitis A sero-epidemiology in Singapore: changing pattern. *Trans R Soc Trop Med Hyg* 1993; 87 : 22-3.