AN OUTBREAK OF HEPATITIS A IN SCHOOL CHILDREN AT NAKHON SI THAMMARAT, SOUTHERN THAILAND

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Abstract. Hepatitis A antibody prevalence in Southeast Asia has markedly declined among children and adolescents. Therefore increasing a number of susceptible populations could result in an outbreak or epidemic. This paper reports an intensive study of an outbreak of hepatitis A in a primary school children during an endemic at Nakhon Si Thammarat, Southern Thailand. Eighty-nine children were inspected randomly from the total of 269 students, age ranged from 7-12 years old. The school children and parents were interviewed for their illness. Serological tests for antiHAV IgM and antiHAV (total antibody) were performed by ELISA. There were 36 cases of clinical acute hepatitis with school absence ranging from 1-21 days (average 7.3 days). Not all cases with acute hepatitis were positive for antiHAV IgM because serological tests were performed nearly 4 months later. Seventy of 89 children tested were positive for antiHAV and 16 of them were positive for IgM class. Seven of 16 children with antiHAV IgM positive were asymptomatic. The signiticant risk factors for children with positive antiHAV were occurrence of hepatitis patients in the family and no latrine ($p < 0.01$). Endemic transmission in this outbreak occurred rapidly. Therefore preventive measures are essential in reducing the infection rate. In addition to personal hygiene, immunoprophylaxis with either immunoglobulin or HAV vaccine is recommended.

INTRODUCTION

Hepatitis A virus (HAV) infection when symptomatic is characterized by jaundice, nausea, vomiting, abdominal discomfort, enlarged and tender liver, fever and other systemic manifestations. HAV predominantly causes acute infections, specifically inflammation of the liver. It is an important public health problem throughout the world (Chitkara and Sachdev, 1988). Now it continues to be a source of morbidity and mortality in both developed and rapidly developing countries. A decline in disease incidence in developed and developing countries, including Japan (Takahashi *et al,* 1990), Australia (Gust, 1992), USA (Frace and Jahre, 1991; Desenclos *et al,* 1991), Europe (Stroffolini *et al,* 1990) and Thailand (Poovorawan *et al,* 1993) has been attributed to general improvement in standard of living. This has resulted in a large proportion of the population that is now susceptible to HAV. Because fecal contamination of water or food sources by the virus has not been completely eliminated, subsequently periodic endemics continue to occur. In 1988 an outbreak was observed in Shanghai, China with more than 300,000 cases of hepatitis detected (Xu *et al,* 1991). Other incidences were also reported *eg* in Jefferson County, Kentucky (Rosenblum *et al,* 1990); in Indian Reservations of South Dakota (Shaw *et al,* 1990); in Panama city, Florida (Desenclos *et al,* 1991) and in Eastern Pennsylvania (Frace *et al,* 1991). The outbreaks of HAV usually occur in particular communities such as children's institutions (Gudkov *et al,* 1990), day-care centers (Reves *et al,* 1990), hospital employees (Takahashi *et al,* 1990) and army units (Yan *et al,* 1990).

In Thailand, HAV infection is one of the major public health problems. The prevalence in 1990 was 31 cases per 100,000 population (Ann Epidemiol Thai Surv Report, 1991). The infection that occurred in Thai children was mostly asymptomatic (Poovorawan *et al,* 1988). Detectable clinical cases are fewer than asymptomatic infected cases, allowing this the disease to spread rapidly.

The unfortunate endemic of HAV that occurred in Nakhon Si Thammarat, Southern Thailand, during May-June 1992, was 5 times the normal prevalence rate causing a serious health problem.

The objectives of this study were to study the clinical manifestations, risk factors of HAV infection and post serological survey in an outbreak at Nakhon Si Thammarat.

MATERIALS AND METHODS

Studied population

Primary school children from a school with hepatitis A outbreak were systematic randomly selected. One third of 269 (No. = 89) of the school students were included in the study. Demographic data of school children are shown in Table 1. The students were verbally interviewed on standards of hygiene, sanitation, history of personal and family illness during March to September 1992. The risk factors which included religion, family income, family size, presence of hepatitis illness and latrines in the family were compared between children with and without positive antiHAV.

Definition of clinical hepatitis A

A child with clinical hepatitis A was defined as an illness (during the period of an outbreak) with symptoms severe enough to cause school absence. The clinical symptoms included fever, malaise, fatigue, nausea, vomiting, abdominal discomfort enlarged and tender liver, dark urine and jaundice. The collected data were validated by counter checking with school records.

Serologic study

Blood samples were taken 3-4 months after an outbreak and collected at -20°C until testing. AntiHAV IgG was determined by using the ELISA technique (Abbott Laboratories, North Chicago, III). This technique was based on the principle of binding antiHAV in a patient's specimen (10 µl) or antiHAV : horseradish peroxidase (antiHAV : HRPO) conjugate (200 µl) to an HAV-coated bead. An HAV-coated bead was incubated (40°C, 3 hours, 15-30°C, 18-24 hours) in a reaction well with a mixture of serum or plasma and the antiHAV : HRPO. If antiHAV was present in the specimen, less antiHAV : HRPO would be bound to the bead. Within limits, the greater the amount of antiHAV in the specimen, the lower the absorbance (492 mm) value for that specimen. In case of results near the cut off point, the test were repeated again. AntiHAV IgM was also determined by ELISA test (Abbott Laboratories, North Chicago, III).

Statistical analysis

Percentage of immunological responses and the presence antiHAV for age-specific prevalence, ratio of symptomatic and asymptomatic patients with positive antiHAV IgM and range and average of liver enzyme levels (SGOT and SGPT) were calculated. The risk factors were analyzed by applying chi-square test.

Table 1

Demographic data on primary school children.

Characteristics		No. of children n = 89
Sex	male	44
	female	45
Religion	Buddhism	48
	Muslim	41

RESULTS

During the two months of an outbreak, there were 36 cases of acute symptomatic hepatitis A. The prevalence was high among the age group between 8-11 years old. Clinical evidence included fever, malaise, fatigue, nausea, vomiting, abdominal discomfort, dark urine and jaundice. Fever was the principal symptom and jaundice was the second one of HAV infection (Table 2).

Table 2

Clinical manifestations of symptomatic children with hepatitis a virus infection.

Signs/symptoms	No. of cases n = 36 cases	%
Fever	33	97.22
Malaise	16	50
Fatigue	20	55.55
Nausea/vomiting	19	52.77
Abdominal discomfort	15	41.66
Jaundice	29	80.55
icteric : anicteric	4:1	

Among the patients with clinical hepatitis, the icteric and anicteric ratio was 4 to 1. Age specific serological prevalence of antiHAV in the school children studied after an endemic was shown in the Fig 1. Seventy of 89 children (79%) were positive for antiHAV post endemic. Sixteen were still antiHAV positive. Of the children with antiHAV IgM, 9 children had symptomatic hepatitis while 7 children had not. The symptomatic to asymtomatic ratio in a group with positive antiHAV IgM was 1.3:1. Liver enzyme levels (SGOT and SGPT) decreased to normal within four months. No complications or mortality occurred during the study period.

Interestingly, having no latrine, and occurrence of symptomatic hepatitis in the family were the significant risk factors in children with positive antiHAV ($p < 0.01$), while religion, family income, family size showed no significant difference (Table 3).

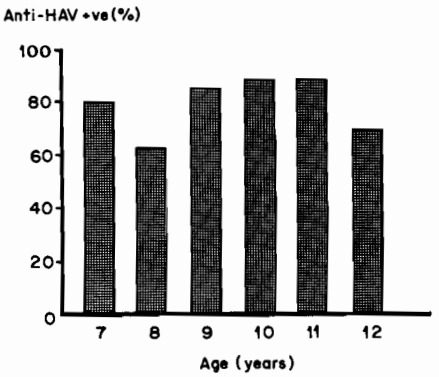

Fig 1– The scroprevalence of antiHAV in primary school children after an outbreak at Nakhon Si Thammarat.

Table 3

Risk factors for virus hepatitis A infections during an outbreak.

Risk factors	X^2	p-value
Religion	0.022	NS
Family income (3,390 + 1,537.72 baht)	5.854	NS
Family size (5.42 + 1.25)	3.215	NS
Occurrence of patients in the family	26.218	$p < 0.01$
No latrine	9.968	$p < 0.01$

DISCUSSION

Nakhon Si Thamrat, a large province in the center of the Southern part of Thailand, is an agricultural and fishing area. The total population is approximately 1.5 million. There were 3 endemic hepatitis outbreaks in the last decade. The first and second outbreaks arose in the year 1982 and 1989, the third one in 1992.

In the past endemic study, 79% of children were antiHAV detectable which included positive antiHAV IgM 18%. Only 21% of children were still susceptible to the disease. Because the serological study was done 3-4 months after an outbreak of the disease, therefore few patients had antiHAV IgM. In cases with antiHAV IgG or IgM, the patients had the same clinical features during this period, which suggested that they were infected by HAV during this outbreak. Without an outbreak, the seroprevalence of antiHAV among primary school children in Thailand was 25-50% (Poovorawan *et al,* 1991; Poovorawan *et al,* 1993). It clearly indicated that, prior to the outbreaks, the primary school children under 12 years old were susceptible to HAV infection.

Hepatitis A has been a major problem in many countries. Improvement of living standards have postponed the childhood infection into adulthood. HAV infection in early childhood is usually subclinical, while symptomatic hepatitis A infections occurs with increasing age (Hadler *et al,* 1980; Benenson *et al,* 1980). Our study showed that the ratio of symptomatic to asymptomatic hepatitis cases with positive IgM was 1.3 to 1.

The antiHAV prevalence in primary school Thai children with low socioeconomic status was seen in higher age group and markedly decreased in younger children from 1988-1993 as compared to the previous reports. Therefore endemicity is more likely because the majority of the population is susceptible to hepatitis A virus (Poovorawan *et al,* 1993).

In asymptomatic hepatitis A infection, the patients can spread the disease rapidly, so when there is an outbreak, people in the endemic area must be alerted to improve their personal hygiene and possibly undertake immunomodulations. In contrast, previous studies done on clinical manifestations reported that in younger children the ratio of symptomatic to asymptomatic was 1 : 4 (Hadler *et al,* 1980).

Clinical manifestations were similar to those reported by Rayman *et al* (1992). However, serological test is mandatory for confirming the HAV infection.

Among the risk factors of HAV infection, the occurrence of symptomatic hepatitis patients and no latrine in the family were the important ones which were similar to previous reports (Papaevangelou, 1984) because large amounts of HAV were in feces of the infected subjects (Castkoya *et al,* 1988). Thus members of the family or others, especially of those without latrine and with general poor standard hygiene might be infected by the contaminated virus in the feces. Additionally, the spread of the disease through everyday contact had been confirmed (Gudkov *et al,* 1990), particularly in the family with persons already infected by HAV.

Future incidents of this kind are likely to occur in Nakhon Si Thammarat. We would strongly recommend that latrine installation should be increased rapidly in time. Moreover, improvement of personal hygiene will assist the decline in disease transmission. Food consumption habits of people should be carefully considered, since other risk factors have been reported such as consumption of fresh products (Rosenblum *et al,* 1990; Ramsay *et al,* 1989) and half-cooked or raw seafood (Desenclos *et al,* 1991; Wang *et al,*1990; Tang *et al,*1991).

The changing incidence of age specific anti HAV prevalence refected the better living standard among those people, probably resulting in an increasing number of susceptible children. Therefore, preventive measures are essential in reducing the infection rate. Other than improvement of personal hygiene, mass vaccination is another promising preventive measure, particularly during an epidemic. Hepatitis A vaccine is widely used in several countries in Europe and Asia, particularly among travelers and soldiers entering hyperendemic countries. The vaccine is highly effective during an outbreak and when given as mass vaccination. However the cost effectiveness of the vaccine should be considered.

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