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臺灣中部地區學齡前孩童感染 E 型肝炎病毒的血清流行病學

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Seroepidemiology of hepatitis E virus infection among preschool children in central Taiwan

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Running title: Seroepidemiology of HEV among children in Taiwan.

Abstract. In order to study the seroprevalence of hepatitis E virus (HEV) infection among preschool children in Taiwan, a community-based survey was carried out in 54 kindergartens in 10 urban areas, 10 rural areas, and 2 aboriginal areas randomly selected through stratified sampling. Serum specimens of 2,538 preschool children were screened for the HEV antibodies (anti-HEV) by a commercially available third-generation microparticle enzyme immunoassay. The multivariate-adjusted odd ratios (OR_m) with their 95% confidence intervals (CI) were estimated through the multiple logistic regression analysis. A total of 86 children were anti-HEV seropositive, giving a prevalence of 3.4%. The prevalence of anti-HEV was 3.9% (19 of 484) among aboriginal children, a significantly increased seroprevalence compared with those among other ethnic groups after multivariate adjustment significantly (OR_m= 7.9; 95% CI= 2.6-24.5; P= 0.0003). Female had a higher anti-HEV seroprevalence than the male (OR_m= 1.6; 95% CI= 1.0-2.4; P= 0.04), a statistically significantly was found. The seroprevalence of children was lower than their teachers (OR_m= 3.5; 95% CI= 1.8-6.8; P= 0.003). There were increasing seropositive rates of HEV antibody with age in aboriginal areas, but decreasing with age in non-aboriginal areas. The poor water supply system, sewage disposal, domestic animals, and environmental hygiene in the aboriginal areas might have played some role in infection with HEV in Taiwan.

Key words: Seroprevalence, anti-HEV, ALT, Preschool children

Introduction

Hepatitis E virus (HEV) is probably the most important cause of enterically transmitted non-A, non-B hepatitis, like HAV, and has been associated with large outbreaks from contaminated water supplies [1]. Taiwan, an endemic area for viral hepatitis A to C, has never had a history of epidemic outbreaks of hepatitis E. The role of HEV infection in acute sporadic hepatitis in Taiwan is unclear [2]. Recently, it was reported that around 10.7% among health adults and 0.3% among school children in Taiwan were seropositive for HEV antibody (anti-HEV), similar to that found in other developed countries [3].

There was no data on the seroepidemiology of hepatitis E virus infection among preschool children in Taiwan. The particular aim of this study is to estimate the seroprevalence of hepatitis E virus infection by geographical area, age, and sex in central Taiwan. There is also carry out to assess the some common transmission routes association between transmissions of HAV vs. HEV.

Materials and Methods

(1) Study population and subject selection

The general population of central Taiwan, including Taichung County and Taichung City, Miaoli County, Changhua County, and Nantou County, is chosen as the study population. The total population is over 5 million in this area. A total of 54 kindergartens in 10 urban areas, 10 rural areas, and 2 aboriginal areas are randomly select.All preschool children in this study are enrolling on a voluntary basis. There are about 484 kindergarten children in aboriginal areas, and 2,054 kindergarten children in urban and rural areas are recruited in this study. A blood sample is collect from each subject, and serum specimens are kept at -70℃ until laboratory examination.

(2) Investigation of risk factors

A short questionnaire interview is carrying out to obtain information or risk factors for hepatitis viruses infection. They include age, sex, ethnicity, residential history, their parent’s education, HAV and HBV vaccination status, number of siblings and family members.

(3). Laboratory examination

Anti-HEV. Anti-HEV serum IgG (immunoglobulin G) is detected by solid-phase EIA (enzyme immunoassay) with a commercially available EIA kit (Abbott HEV EIA, Abbott Laboratories, North Chicago, IL, USA) according to the manufacturer's instructions. Specimens with absorbance values greater than or equal to the cutoff value are considered Specimens with absorbance values greater than or equal to the cutoff value are considered criteria of Abbott HEV EIA.

Liver function test. All the sera are evaluate by liver function test through the determination of alanine aminotransferase (ALT) levels by the automatic machine Beckman Synchron CX-5 (Beckman Instruments, Inc., Brea, CA, USA).

(4). Data analysis and statistical methods

Statistical analysis was performed with SPSS software (Ver. 8.0.1; SPSS Inc.). The increasing trend of age-specific seropositive rates was tested for statistical significance by the chi-square test for trend. Multivariate-adjusted odds ratios (OR) with their 95% confidence intervals (CI) were estimated through the multiple logistic regression analysis. The statistical significance of the difference in age-sex-adjusted seropositive rates among comparison groups was examined by the Mantel-Haenszel summary chi-squared test.

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Table 1. Seroprevalence of hepatitis E virus infection among kindergarten children in Taiwan by age and residential area

Age (year)	Non-aboriginal areas			Aboriginal areas			Total		
	Tested	Seropositive		Tested	Seropositive		Tested	Seropositive	
	No.	No.	(%)	No.	No.	(%)	No.	No.	(%)
3	124	5	4.0	72	1	1.4	196	6	3.1
4	529	20	3.8	123	2	1.6	652	22	3.4
5	1054	34	3.2	193	9	4.7	1247	43	3.4
6	347	8	2.3	96	7	7.3	443	15	3.4
Total	2054	67	3.3	484	19	3.9	2538	86	3.4

Table 2. Seroprevalence of antibodies against hepatitis E virus by sex and study areas among kindergarten children and their teachers in Taiwan

Variable	Groups	Children (≦6 years)			Teachers (≧18 years)		
		Tested	Seropositive		Tested	Seropositive	
		No.	No.	(%)	No.	No.	(%)
Sex							
	Female	1186	48	4.0	108	14	13.0
	Male	1352	38	2.8	12	1	8.3
Study areas							
	Urban areas	1276	38	3.0	64	5	7.8
	Rural areas	778	29	3.7	40	7	17.5
	Aboriginal	484	19	3.9	16	3	18.8
Total		2538	86	3.4	120	15	12.5

Table 3. Multivariate-adjusted odds ratios and 95% confidence intervals based on a multiple logistic regression model (N=2658)

	Hepatitis E virus		
Variables	OR	95% CI	*p*-value
Sex			
Male	1.0	Referent	
Female	1.563	1.014-2.408	0.043
Age groups			
Children (≦6 years)	1.0	Referent	
Teachers (≧18 years)	3.475	1.773-6.808	0.003
Ethnicity			
Non-aborigine	1.0	Referent	
Aborigine	7.936	2.564-24.558	0.0003
Resident areas			
Mountain area	1.0	Referent	
Urban area	1.180	0.734-1.898	0.575
Rural area	1.362	0.816-2.247	0.295

OR= odds ratio, CI= confidence interval.

Table 4. Comparison of prevalence of hepatitis E virus infection among preschool children in Taiwan

	Blood collection		Age	Tested	HEV
Authors [year]	Areas	Year	(year)	No.	prevalence
Lee et al. [1994]	Taipei (northern)	1981-92	6-10*	600	0.3%
Peng et al. [1995]	Kaohsiung (southern)	1993-4	6-15**	67	1.5%
Peng et al. [1995]	Pingtung (eastern)	1993-4	6-15*	104	9.6%
This study [2003]	Central Taiwan	1998-9	3-6**	484	3.9%
This study [2003]	Central Taiwan	1996-7	3-6*	2054	3.3%

*Non-aboriginal children, **Aboriginal children.