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Short Communication

AN EPIDEMIOLOGIC STUDY ON HEPATITIS B VIRUS ON AN ISOLATED ISLAND IN SHIMANE PREFECTURE

(hepatitis B virus/isolated island/epidemiology)

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The prevalences of hepatitis B virus (HBV) markers on an isolated island in Shimane Prefecture were examined. Serum samples were collected from 294 (62.8 per cent) of 468 individuals aged 20-64 years old living in three villages on the island. The prevalence of hepatitis B surface antigen (HBsAg) was 6.5 per cent and the highest rate was found in the 40-49 years age group (12.7 per cent). The comparison of HBsAg carriers and controls demonstrated differences according to "Blood transfusion" experience and "Previous liver disease".

In seroepidemiologic studies that have been carried out in Japan (1-4), approximately 2-7.5 per cent hepatitis B surface antigen (HBsAg) has been found. Recent seroepidemiologic study on 3,738 residents in a total of 10 districts in Shimane Prefecture demonstrates that the mean prevalence of HBsAg is 2.7 per cent (5). The correlation between hepatitis B virus (HBV) and liver cirrhosis has been reported (6). The death rate from liver cirrhosis is high, and this disease turns out to be the ninth greatest cause of death in Shimane Prefecture. The rate of deaths from liver cirrhosis in Japan stood at 4.2 (per every 100,000 persons) in 1981, whereas Shimane Prefecture registered a high mortality of 20.0 (7).

A few epidemiologic studies have been made of HBV infection on an isolated island in Japan. On the isolated island of Nishinoshima in Shimane Prefecture, the rate (4.7%) of deaths

from liver cirrhosis to the total deaths in 1969-1978 was higher than that (1.9%) in Shimane Prefecture.

The purpose of this present study was to clarify the prevalence of HBV infection on Nishinoshima. On this isolated island we examined the prevalence of five serologic markers of HBV, namely, HBsAg, antibody to HBsAg (anti-HBs), hepatitis Be antigen (HBeAg) and antibody to HBeAg (anti-HBe), antibody to hepatitis B core antigen (anti-HBc).

MATERIALS AND METHODS

The isolated island of Nishinoshima is located about 44 Km north of Shimane Penisula in the Japan Sea. There are fifteen villages on the island, the total population of which was 4,830 in 1980. The chief occupation of the island is fishing, which provides its main income. Serum samples were collected from 294 (62.8 per cent) of 468 individuals aged 20 - 64 years old living in three villages on the island.

HBsAg was assayed by AUSRIA-II radioimmunoassay (Dinabot, Tokyo). Anti-HBs was determined by AUSAB radioimmunoassay (Dinabot, Tokyo). HBeAg and anti-HBe were assayed by ABBOTT-HBe radioimmunoassay (Dinabot, Tokyo). Anti-HBc was confirmed by CORAB radioimmunoassay (Dinabot, Tokyo).

We distributed a medical questionnaire with the following items ; medical history of previous liver disease, family history of liver disease, blood transfusion, acupuncture (over twice/month), injection (over twice/month), and alcohol habits (over 180 ml of Sake/day). All information was collected from personal interviews by trained public health nurses.

Comparison of HBV carriers and controls as to the presence or absence of the information items in those interviewed was performed. Eighty-five blood donor candidates found positive for HBsAg (19) or anti-HBs (66) on September 27 and 28, 1982 were identified as cases. Controls were selected from the population of donors, using the method of pair-matched sampling with respect to sex and age (±5). As regards HBsAg, two controls per one carrier were selected for a small number of HBsAg carriers. The mean ages of HBsAg or Anti-HBs carriers in males were 43.6 and 50.3, respectively. In females the mean ages of HBsAg or Anti-HBs carriers were 46.5 and 52.2, respectively.

Statistical methods used were Student's t value, Chi-square

value and Odds ratio to assess the difference observed, and McNemar's tests (8) for comparison between HBV carriers and controls.

RESULTS

Table I shows prevalences of HBsAg or anti-HBs. Prevalence of HBsAg was 6.5 per cent and the highest rate was found in the 40 -49 years age group (12.7 per cent). There was no significant relationship between HBsAg-positive and age. Prevalence of anti-HBs were 22.4 per cent and increased significantly with age. The total rates (HBsAg and anti-HBs) did not show any relation to age and were found in more than 30 per cent above age 30 years. There were no significant sex differences in the rates of HBsAg, anti-HBs and the total rate (HBsAg + anti-HBs).

The total rates of HBsAg and anti-HBs were low in A (28.3 per cent) and C villages (17.1 per cent), while a high rate was found in B village (42.3 per cent) (Table II). This was mainly due to a difference in the rate of anti-HBs. Prevalence of HBsAg varied from 4.2 per cent in B village to 7.5 per cent in A village but the differences were not significant.

Table I. SEROLOGIC MARKERS OF HEPATITIS B VIRUS BY AGE AND SEX

Age / Sex	No. tested	HBsAg No. positive	HBsAg %	Anti-HBs No. positive	Anti-HBs %	Total No. infected	Total %
20-29	32	0	0	2	6.2	2	6.4
30-39	42	3	7.1	10	23.8	13	31.0
40-49	71	9	12.7	13	18.3	22	31.0
50-59	100	6	6.0	26	26.0	32	32.0
60-64	49	1	2.0	15	30.6	16	32.7
Total	294	19	6.5	66	22.4	85	28.9
		X^2=6.41 N.S.		X^2=10.30 p<0.05		X^2=9.03 N.S.	
Male	116	8	6.9	31	26.7	39	33.6
Female	178	11	6.2	35	19.7	46	25.8
Total	294	19	6.5	66	22.4	85	28.9
		X^2=0.00 N.S.		X^2=2.37 N.S.		X^2=2.07 N.S.	

N.S. ; not significant
Chi-square analyses were done between the prevalances of HBV markers and age or sex.

Table II. SEROLOGIC MARKERS OF HEPATITS B VIRUS BY VILLAGE

Village	No. tested	HBsAg No. positive	HBsAg %	Anti-HBs No. positive	Anti-HBs %	Total No. infected	Total %
A	147	11	7.5	31	21.1	42	28.3
B	71	3	4.2	27	38.0	30	42.3
C	76	5	6.6	8	10.6	13	17.1
Total	294	19	6.5	66	22.4	85	28.9
		X^2=0.99 N.S.		X^2=17.8 p<0.005		X^2=11.31 p<0.005	

N.S. ; not significant
Chi-square analyses were done between the prevalences of HBV markers and village.

Prevalences of HBsAg, anti-HBe or anti-HBc markers among HBsAg carriers are demonstrated in Table III. A high rate of anti-HBe (78.9 per cent) was found, but a low rate (5.3 per cent) of HBeAg. The rate of anti-HBc marker among HBsAg carriers was high (84.2 per cent). There was no significant sex difference in HBsAg.

Table III. PREVALENCE OF HBeAg, Anti-HBe OR Anti-HBc MARKERS AMONG HBsAg CARRIERS

Sex	No. HBsAg(+)	HBeAg No. positive	HBeAg %	Anti-HBe No. positive	Anti-HBe %	Anti-HBc No. positive	Anti-HBc %
Male	8	1	12.5	6	75.0	8	100.0
Female	11	0	0.0	9	81.8	8	72.7
Total	19	1	5.3	15	78.9	16	84.2

Significant differences between HBsAg carriers and controls (Table IV) were found in the presence of "Blood transfusion" and "Previous liver disease". High Odds ratios and Chi-square values were found in "Blood transfusion", "Previous liver disease" and "Family history of liver disease".

No significant differences between cases and controls of anti-HBs were found. However, the Odds ratio and Chi-square value in "Blood transfusion" were high (2.6 and 2.08, respectively).

Table IV. COMPARISONS OF HBsAg CARRIERS AND CONTROLS AS TO THE PRESENCE OR ABSENCE OF THE INFORMATION ITEMS INTERVIEWED

	% positive				
	Cases	Controls	Odds ratio	X^2 value	McNemar's test
Previous liver disease	35.0	12.5	3.8	3.8	*
Family history of liver disease	40.0	25.0	2.0	1.79	N.S.
Blood transfusion	20.0	5.0	4.8	6.13	**
Acupuncture	5.0	7.5	0.6	0.09	N.S.
Injection	40.0	32.5	1.4	0.19	N.S.
Alcohol	25.0	22.5	1.1	0.09	N.S.

* ; $p<0.05$, ** ; $p<0.005$, N.S. ; not significant

DISCUSSION

The prevalences of HBV markers on the isolated island of Nishinoshima were examined. Compared with previous studies (1-4), the rate of anti-HBs was low, but the prevalence of HBsAg (6.5%) was high. High prevalence of HBsAg was found in the working age group (30-49 years age) and the rate of HBsAg among villages showed high values. The correlation between HBV and liver cirrhosis has been reported (6). High mortality rate from liver cirrhosis on the island may be related to the high prevalence of HBsAg. A further study on the prevalence of HBsAg in liver cirrhosis patients is needed, because the causes of liver cirrhosis have been considered to be HBV, alcohol, hepatitis non-A non-B virus, etc.

There were two significant differences between HBsAg carriers and controls in the presence of "Blood transfusion" and "Previous liver disease". This result may show a correlation between HBV infection and liver disease at Nishinoshima. An epidemiologic study on liver disease, in respect to HBV, hepatitis A virus, hepatitis non-A non-B virus, alcohol, etc, on the island is being performed now. When people on Nishinoshima enter hospital as patients, they choose from various hospitals in Japan's main island (in Shimane and Tottori Prefectures). The significant difference in the presence of "Blood transfusion" may show the possibility of HBV infection by types of medical treatment (9.10). However, the rate of "Blood transfusion" among HBsAg carriers (20.0 per cent) was low, and this cannot clarify all the causes of the high HBsAg infection. A remarkable difference in infectivity between the HBeAg-positive serum and

the anti-HBe-positive serum has been demonstrated ; the former was more infectious than the latter (11). The low prevalence of the HBeAg marker among HBsAg carriers suggests that there may be high prevalence of HBV infection in the 0-19 years age group. In order to clarify the causes of the high HBsAg infection, further studies are needed on the prevalence of HBV infection in youths and the infection clustered in families.

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