

Epidemiology of Hepatitis B Virus in Japan, especially in Nagasaki

Tsutomu MIYAMOTO

*Department of Bacteriology, Nagasaki
University School of Medicine*

We have studied about epidemiology of hepatitis B virus (HBV) in Japan, especially in Nagasaki these ten years. Chronological changes of HBV infection were observed and are reported here.

MATERIALS AND METHODS

Sera: Sera were obtained from blood donors and healthy inhabitants, and stored at -20°C until use.

*Methods used for detecting Hepatitis B surface antigen (HBsAg) of HBV, anti-HBs antibody and antibody against HBV core antigen (anti-HBc antibody)*¹⁾: Passive hemagglutination (PHA) method and reversed PHA (RPHA) method (Eisai Co. Ltd., Japan) were used for detecting anti-HBs antibody and HBsAg, respectively. Anti-HBc antibody was measured by RPHA inhibition test. Essentially, the tannic acid-treated human type O red blood cells were coated with anti-HBc IgG prepared from HBsAg-positive blood donor sera by sedimentation with saturated ammonium sulfate and by purification using DEAE-cellulose column chromatography. HBV infected liver obtained by autopsy was homogenized by phosphate buffered saline and followed by adding chloroform. After shaking and centrifugation, aqueous layer was removed and used as HBc antigen. For detecting anti-HBc antibody, serum sample was mixed with HBc antigen and applied on the anti-HBc antibody-coated red blood cells. When the inhibition of hemagglutination is observed, the serum sample is scored as anti-HBc antibody-positive.

RESULTS

The prevalence of HBV carrier in Japan and in Nagasaki

The prevalence of HBsAg positive carriers in blood donors of whole Japan, which is released from annual reports of Japan Red Cross blood center where 5 to 6 million

serum samples/year have been tested, has been estimated as 1.8 to 1.9%. However, it is highest in Kyushu island, that is over 2.6%. Moreover, in Nagasaki Prefecture, the prevalence of HBsAg is 3.8%, and those of anti-HBs and anti-HBc antibody are 18.8% and 22.6%, respectively, indicating that Nagasaki is higher endemic area of HBV in Japan.

In Nagasaki, the prevalence of HBsAg is slightly higher in male than in female (4.2 to 2.9%) and has a tendency to decrease with aging (4 to 3%). In contrast with the case of HBsAg, the prevalence of anti-HBs antibody becomes higher with aging (17 to 28%) and showed no difference between male and female. The patterns of the distribution of the prevalence of anti-HBc antibody in age and sex was also the same as those of anti-HBs antibody.

From these results, an estimate of the infected populations in past and at present in an area of Nagasaki was carried out. In Table 1, since 53 out of 2618 inhabitants are HBsAg-positive, they are estimated as infected with HBV at present. 309 with anti-HBs antibody were infected with the virus in past. 309 out of 2256 inhabitants who are negative for both HBsAg and anti-HBs antibody, but positive for anti-HBc antibody were also infected with HBV in past. Therefore, 671 (53+309+309), 25.6% in this population had or have history of HBV-infection.

Table 1. Prevalences of three HBV markers in an area of Nagasaki Pref.

HBs Ag	positive	negative	negative	Total
Anti-HBs	negative	positive	negative	
Anti-HBc				
positive	52(98)*	232(75)	309(14)	593
negative	1(2)	77(25)	1947(86)	2025
Total	53	309	2256	2618

*() : %

Epidemiology and cohort study of HBV in Gotoh island

The prevalences of three HBV markers in 5 local areas of Nagasaki¹⁾ have been investigated. It was found that Gotoh island, where is 80 Km away west from the mainland Nagasaki, is hot spot of HBV-endemic. The prevalences of HBsAg, anti-HBs and anti-HBc antibody in Gotoh were 5.8%, 23.8% and 28.5%, respectively, and were significantly higher than those in the mainland. The estimate of infectious rate which was calculated as previously described was about 56%.

However, the recent age distribution of the prevalences of HBV markers in younger people, under 20 years of age, is significantly lower than that in older age group (Table 2).

A cohort study of HBV-infection these 10 years was carried out and the result

Table 2. Age distribution of the prevalences of HBV markers in Gotoh island, Nagasaki

Age (Y)	No. positive (%)			No. tested
	HBs Ag	Anti-HBs	Anti-HBc	
6-12	8(1.4)	10(1.7)	28(4.8)	585
13-15	7(1.4)	31(6.1)	59(11.6)	509
16-18	0	3(6.1)	5(10.2)	49
Total	15(1.3)	44(3.9)	92(8.1)	1,143
20-	2(7.7)	9(34.6)	11(42.3)	26
30-	9(16.4)	9(16.4)	24(43.6)	55
40-	12(9.9)	21(17.4)	58(47.9)	121
50-	7(4.0)	39(22.2)	93(52.8)	176
60-	6(3.8)	37(23.4)	78(47.4)	158
70-	5(4.6)	20(18.2)	56(50.9)	110
Total	42(6.3)	140(21.0)	332(49.8)	667

Table 3. Cohort study of HBV-infection in Gotoh island (1974 to 1983)

HBs Ag	Anti-HBs	Anti-HBc	No. of Samples (%)
—*	—	—	63(34.1)
+*	—	+	6(3.2)
+→—	—/+	+	2(1.1)
—	—/+	+/-	114(61.6)
No. tested (Total)			185

*—: negative, +:positive

is shown in Table 3. In the blood samples obtained from the same individuals, 6 out of 185 are found to be HBsAg positive and this status has unchanged through 10 years. Therefore, these 6 are the true virus carriers. Since 2 inhabitants who might fall into HBV carriers in a cross-sectional study were seroconverted, the number of HBV carriers will be fewer than that estimated in usual cross-sectional, epidemiological studies. From the result shown Table 3, it is evident that the population who has not been exposed with HBV is only 1/3 of tested population.

DISCUSSION

It has been made clear that Nagasaki, especially Gotoh island is high endemic area of HBV. The prevalences of HBV markers well correlated to death rate of liver diseases, such as liver cirrhosis and primary hepatoma²⁾.

However, as seen in Gotoh island, the HBV-infection rate is decreasing in younger generation. Although the causal factors are under investigation, socioeconomical factors might affect this event. For example, the maternity service was established 19 years ago in Gotoh and almost all of babies have been delivered there. Changing needles on vaccination at schools have been carried out since 1973 and Red Cross blood Center, where checking HBsAg in blood samples was begun, was also opened 14 years ago. Since the decrease of HBV-infection in younger age group is generalized in whole Japan, the diminution of liver diseases such as chronic hepatitis, liver cirrhosis and primary hepatoma are expected in the near future in Japan.

The cohort study is necessary to obtain detailed endemic patterns of HBV and it also will contribute to prevent and control liver diseases caused by HBV.

REFERENCES

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