

Prevalence of Hepatitis C Virus Antibody Among Korean Adults

Young Sik Kim, M.D., Chik Hyun Pai, M.D.¹, Hyun Sook Chi, M.D.¹,
Dae Won Kim, M.D.¹, Young Il Min, M.D.², and Yoon Ok Ahn, M.D.³

*Departments of Family Medicine, Clinical Pathology¹ and Internal Medicine²,
College of Medicine, University of Ulsan: Department of Preventive Medicine,
Seoul National University College of Medicine³, Korea*

To estimate the prevalence of hepatitis C virus (HCV) infection among Korean adults and to present the putative route of HCV transmission among them, serum samples from 4917 adults older than 20 years of age were tested for antibody to HCV (anti-HCV), and histories of blood transfusion and other pertinent information were obtained by self-administered questionnaires. The overall prevalence of anti-HCV was 1.7%; prevalence was 1.4% in subjects with normal levels of aspartate aminotransferase (AST) and alanine aminotransferase (ALT), 3.3% in those with slightly elevated and 5.9% in those with markedly elevated levels of the enzymes. The prevalence of anti-HCV increased with increasing age ($P < 0.01$), but was not associated with blood transfusion. The present study suggests that the prevalence of HCV infection was 1.4% and that the major routes of HCV transmission may be other than blood transfusion in healthy Korean adults.

Key Words: Hepatitis C Virus, anti-HCV

INTRODUCTION

Chronic liver disease is the 3rd most common cause of morbidity in inpatients in Korea (KMIC, 1990), and the age-adjusted incidence rates of liver cancer among Koreans were 30.5 and 7.6 per 100,000 in males and females, respectively (Ahn et al., 1989). Although chronic hepatitis B virus (HBV) infection is an important risk factor of hepato-morbidity and mortality in Korea (Kim et al., 1983; Yoo et al., 1988), HBV markers could not be found in about 10% of patients with chronic liver disease (Suh et al., 1982). A recent report revealed that hepatitis C virus (HCV) antibodies were found in 66.7% of patients with post-transfusion non-A, non-B (NANB) hepatitis, 47.4% of those with chronic NANB hepatitis, 41.2% of those with hepatitis B surface antigen (HBsAg) negative cirrhosis and 48.1% of those with HBsAg-negative hepatocellular carcinoma

(Chung et al., 1990). It suggested that about half of the patients with NANB hepatitis or HBsAg-negative chronic liver diseases are suffering from hepatitis C, and that the major route of transmission is parenteral, such as transfusion. On the other hand, Kwon et al., 1991 reported that an epidemic of NANB hepatitis in a community was caused by HCV, which suggests the possibility of HCV transmission in hospitalized patient groups, e.g. those with elevated aspartate aminotransferase (AST) and alanine aminotransferase (ALT) etc., being parenteral, but that subclinical infection in the community is transmitted through non-parenteral routes. For the evaluation of HCV transmission, both types of subjects, clinically overt cases and subclinical healthy persons need to be investigated simultaneously.

The purposes of this study were to estimate the prevalence of hepatitis C virus infection among Korean adults without symptomatic liver disease and to present the putative routes of HCV transmission among them.

MATERIALS AND METHODS

All 4917 subjects who underwent a general check-up at Asan Medical Center, Seoul, Korea from June

Address for correspondence: Young Sik Kim, Department of Family Medicine, Asan Medical Center, Kang-Dong P.O. Box 145, Seoul 138-600, Korea. Tel: (02) 480-3252

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1990 to February 1991 were enrolled if they had no clinical evidence of liver disease. The subjects were grouped into 'Normal' and 'Elevated' by the level of AST and ALT. The elevated group comprised the subjects with AST and ALT levels exceeding the upper limit of normal for our laboratories (AST >25 IU or ALT >29 IU).

HBsAg, antibody to HBsAg (anti-HBs) and antibody to hepatitis B core antigen (anti-HBc) were tested by radioimmunoassay (AUSRIA, AUSAB and CORAB respectively, Abbott Laboratories). Anti-HCV was tested by an enzyme-linked immunoabsorbent assay (Abbott Laboratories). History of blood transfusion and hepatitis B vaccination, family history of liver disease, past history of hepatitis, marital status, duration of education, occupation, and smoking and alcohol habits were obtained by self-administered questionnaires. Statistical analyses for the relation of several variables with anti-HCV positivity were performed using the chi-square test.

RESULTS

The overall prevalence of anti-HCV among Korean adults without symptomatic liver disease is 1.7% in both sexes. But the prevalence was significantly higher in the elevated group than in the normal group ($P < 0.01$). As seen in Table 1, anti-HCV prevalence among males is 1.4% in the normal group, 2.2% in the slightly elevated group, and 6.2% in the markedly elevated group. Among females, it was 1.3% in the normal group, 7.7% in the slightly elevated group, and 4.6% in the markedly elevated group.

The anti-HCV prevalence ratio of the elevated group to the normal group is much higher in females (4.3) than in males (1.7), even though the prevalence in the normal group is nearly the same between the sexes. Meanwhile, the prevalence of HBsAg was also significantly higher ($P < 0.01$) in those with elevated AST and ALT (11.3-27.7%) than in those with normal AST and ALT (4.6%). An overall increasing tendency of anti-HCV prevalence with age was observed.

There was no difference in the prevalence of anti-HCV among those with or without HBV markers (Table 2). Also, the prevalence of anti-HCV was not associated with blood transfusion (Table 2). The following factors were not associated with the prevalence of anti-HCV; marital status, duration of education, occupation, ABO blood type, history of HBV vaccination, family history of liver disease and past history of hepatitis (data not shown). Anti-HCV prevalence was higher in female drinkers than in female non-drinkers ($P < 0.05$) but it was not different between smokers and non-smokers.

DISCUSSION

The present study shows that the prevalence of anti-HCV among healthy adults in Korea is 1.35% (95% CI 1.05-1.72), which is similar to that reported from Germany (Kühnl et al., 1989), the United States (Kuo et al., 1989), France (Janot et al., 1989), Italy (Sirchia et al., 1989) and Japan (Watanabe et al., 1990) (0.42%-1.14%). Unlike the male preponderance of HBsAg carriers in Korea, there was no relation between the presence of anti-HCV and the sexes, which is consistent with the report by Italian author (Sirchia

Table 1. Prevalence of Anti-HCV and HBsAg in relation to the Level of Aspartate Aminotransferase (AST) and Alanine Aminotransferase (ALT) among 4917 Adults in Korea

Level of* AST & ALT	Male			Female		
	No. of tested	Anti-HCV(+) (%)	HBsAg(+) (%)	No. of tested	Anti-HCV(+) (%)	HBsAg(+) (%)
Normal	2,338	1.4	4.6	1,887	1.3	4.7
Slightly elevated	456	2.2	11.6	117	7.7	10.3
Markedly elevated	97	6.2	28.9	22	4.6	22.7
Total	2,891	1.7 ^a	6.5 ^c	2,026	1.7 ^b	5.2 ^d

* Normal: AST \leq 25 and ALT \leq 29

Slightly elevated: 25 < AST \leq 50 or 29 < ALT \leq 58

Markedly elevated: AST > 50 or ALT > 58

a χ^2 for trend: 10.4 ($P < 0.01$)

b χ^2 for trend: 21.7 ($P < 0.01$)

c χ^2 for trend: 103.7 ($P < 0.01$)

d χ^2 for trend: 19.7 ($P < 0.01$)

Table 2. Prevalence of Anti-HCV in relation to Some Selected Variables by the level of AST and ALT among 4917 Korean Adults

Variables	Male						Female					
	Normal* AST/ALT		Elevated* AST/ALT		Total		Normal AST/ALT		Elevated AST/ALT		Total	
	No. tested	Prevalence (%)	No. tested	Prevalence (%)	No. tested	Prevalence (%)	No. tested	Prevalence (%)	No. tested	Prevalence (%)	No. tested	Prevalence (%)
Age group												
20-29	77	0.0 ^a	21	0.0 ^b	98	0.0 ^c	89	0.0 ^d	4	0.0 ^e	93	0.0 ^f
30-39	579	0.9	141	0.0	720	0.7	647	0.8	21	9.5	668	1.1
40-49	1061	1.9	239	2.5	1300	2.0	635	0.8	41	2.4	676	0.9
50-59	443	1.4	108	3.7	551	1.8	368	2.5	47	8.5	415	3.1
60-69	141	1.4	36	13.9	177	4.0	129	3.1	20	5.0	149	3.4
70-	37	0.0	8	12.5	45	2.2	19	5.3	6	33.3	25	12.0
HBV markers												
HBsAg Anti-HBs Anti-HBc												
+	-	-	2	0.0	2	0.0	4	0.0	0	0.0	0	0.0
+	-	+	98	1.0	67	1.5	165	1.2	79	0.0	15	0.0
+	+	+	8	0.0	12	0.0	20	0.0	9	0.0	2	0.0
-	+	+	1441	1.5	290	2.4	1731	1.7	943	1.4	78	10.3
-	+	-	366	0.8	76	2.6	442	1.1	412	1.2	20	5.0
-	-	+	168	2.4	43	9.3	211	3.8	70	0.0	10	10.0
-	-	-	255	1.2	63	3.2	318	1.6	374	1.6	14	0.0
History of transfusion												
No			1920	1.5	452	2.9	2372	1.7	1346	1.3	88	9.1
Yes			184	1.6	38	7.9	222	2.7	260	0.8	23	0.0
Alcohol												
No			343	1.5	77	3.9	420	1.9	829	0.7	70	4.3
Yes			1733	1.4	408	2.7	2141	1.6	590	1.7	38	13.2
Smoking												
never			481	1.5	107	0.0 [#]	588	1.2	1147	1.1	85	8.2
ever			1652	1.5	397	4.0	2049	2.0	384	1.8	32	6.3

* $P < 0.05$ # Normal: $AST \leq 25$ and $ALT \leq 29$, Elevated: $25 < AST$ or $29 < ALT$ a X^2 for trend: 0.4 ($P > 0.05$)b X^2 for trend: 17.4 ($P < 0.01$)c X^2 for trend: 8.6 ($P < 0.01$)d X^2 for trend: 11.0 ($P < 0.01$)e X^2 for trend: 1.7 ($P > 0.05$)f X^2 for trend: 18.2 ($P < 0.01$)

et al., 1989).

The prevalence of anti-HCV increased progressively with age. Similar age patterns have been reported from other countries (Stevens et al., 1990). These findings may be accounted for by the cumulative effects of prolonged exposure to risk factors.

The overall prevalence of anti-HCV (1.7%) is higher than that reported from Korean blood donors (0.9%) (Kim et al., 1990). This may be due to the study population reflecting the higher proportion of the persons with old age and those with elevated ALT.

There was no relation between HBV markers and anti-HCV. Although the prevalence of anti-HCV was slightly higher in the male normal group with anti-HBc positive only (2.38%), than in those with any combination of positive HBV markers (1.41%), the difference was not statistically significant. These findings suggest that anti-HBc may not be used as a surrogate marker for NANB hepatitis in Korea, which was proposed in a report from hyperendemic area (Lin-chu et al., 1990) and support the recommendation that blood donors be screened for anti-HCV.

The anti-HCV prevalence ratio of the elevated group to the normal was higher among females, while there was no difference in the prevalence of anti-HCV among the normal group with respect to sex and the proportion of subjects with elevated AST and ALT was higher in the male (19.1%) than in female (6.9%) groups. HCV infection may have more impact on females in Korea.

Because the prevalence of anti-HCV was also significantly higher in subjects with slightly elevated AST and ALT than in those with normal AST and ALT, it is recommended that anti-HCV screening be mandatory in subjects with elevated AST and ALT, especially given HBsAg negative status.

Blood transfusion has been identified as a major risk factor for HCV infection (Nishioka et al., 1991). However, no differences could be found in the present study in the prevalence of anti-HCV between transfused and non-transfused groups, suggesting that the transmission of HCV in Korea may be by routes other than blood transfusion, although the persons infected via transfusion were more symptomatic.

The prevalence of anti-HCV was significantly higher in female drinkers than in female non-drinkers. In this study population, 23% of housewives are reported to be drinkers compared to 52-92% of professional and otherwise employed women. Possible explanations would include a greater chance of exposure to risk factors by female drinkers who would be more likely to have a place of employment outside their homes than by a female non-drinker who would be more likely to be a housewife.

Some shortcomings of the present study are; first, the use of the ELISA test for anti-HCV without confirmatory assay which may yield false positive results, particularly in populations with a relatively low prevalence of infection such as healthy adults. Second, the study was not designed to examine homosexuality and drug addiction as risk factors, although the size of these population are known to be much smaller in Korea than in North America and Europe. Third, the present study population may not be truly representative of the general population of Korea, since included in the study were those visiting a health screening center and, therefore, some ill individuals could also be included. In spite of these shortcomings, this study provides data for the first time on the prevalence of anti-HCV in relation to the level of AST and ALT and its age distribution among Korean adults.

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