Original Article

Investigation of Hepatitis C Virus Infection Rate of Patients in a General Hospital

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Objective To investigate the infection rate of hepatitis C virus among the ambulatory patients and in-patients of a tertiary teaching hospital, and study the demographic factors related to the prevalence of hepatitis C virus infection.

Methods All patients tested for hepatitis C virus antibody from July 2008 to July 2009 in Peking Union Medical College Hospital were enrolled in this cross-sectional analysis. The prevalence of hepatitis C virus infection was compared according to age, gender, and departments, respectively. Among patients with positive serology hepatitis C virus marker, the positivity of hepatitis C virus RNA was analysed.

Results Among 29 896 subjects included, the hepatitis C virus antibody of 494 patients were positive (1.7%). When patients were divided into 9 age groups, the age specific prevalence of hepatitis C virus antibody were 0.2%, 1.7%, 1.2%, 1.1%, 1.5%, 1.9%, 2.6%, 2.4% and 2%, respectively. The prevalence of hepatitis C virus antibody in non-surgical department and surgical department was 3% and 1%, respectively. The prevalence of hepatitis C virus antibody of males was higher than that of the females. Total of 194 patients with positive hepatitis C virus antibody were tested for hepatitis C virus RNA, the RNA level of 113 patients (58.2%) were higher than the low detection limit.

Conclusions The prevalence of hepatitis C virus antibody was relatively high among patients of general tertiary hospital. Age group of 60-69, males and patients in non-surgical departments were factors associated with high rate of hepatitis C virus infection.

Key words: Infection rate; Hepatitis C virus; Patients of tertiary teaching hospital

Hepatitis C virus (HCV) infection is a major risk factor for the end-stage liver disease and hepatocellular carcinoma (HCC). Approximately 170 million people are infected with HCV worldwide, and severe HCV epidemics were reported from the Western Pacific and Southeast Asia regions.¹ In China, a nationwide viral hepatitis serological epidemiological survey from 1992 to 1995 showed that the average prevalence of HCV antibody (anti-HCV) was 3.2%.² A cross-sectional study in six regions of China in 2007 reported that the infection

rate of HCV was 0.58%.³ In 2009, a total of 131 849 HCV cases were reported in the national disease surveillance system.

Few studies have investigated the infection rate of HCV and virology positivity among patients in general hospitals in China. We conducted this retrospective study to evaluate the infection rate of HCV in Peking Union Medical College Hospital and viral load of serologically positive patients to supply data for making preventing measures.

METHODS

Data collection

All patients who were tested for HCV antibody in central clinical laboratory and infectious disease department from July 2008 to July 2009 were enrolled. Demographic information including age, gender, dates of testing and departments were analysed from laboratory records. For patients with

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positive anti-HCV, the result of HCV RNA was sought based on patients' unique hospital record number, and collected if available.

Laboratory testing

Anti-HCV was detected using enhanced chemiluminescence (ECL) (immunoassay analyzer for ECL, manufacturer of the reagent is Johnson & Johnson in America); HCV RNA was detected by real-time fluorescent quantitative PCR (ABI5700, reagent is made in Zhongshan University Da'an Gene Limited Liability Company, Guangzhou, China).

Statistic analysis

All patients were divided into 9 age groups, that were 0-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79 and ≥ 80 age group, the prevalence of anti-HCV was calculated in each group. They were also divided into 3 groups according to surgical department (outpatient and inpatient), non-surgical department (outpatient and inpatient) and health examination center, and the prevalence of anti-HCV was calculated respectively. The proportion of patients with higher HCV RNA copies than the low detection limit were also calculated. Proportions were compared using chi-square test. All tests were two-tailed with the significant level of 0.05. All analyses were carried out with the use of SPSS software for Windows (release 17.0).

RESULTS

From July 2008 to July 2009, 29 896 patients were tested for anti-HCV, among whom 54.4% were outpatients, 45% were inpatients, and 0.6% were from routine health examination. Total of 18 724 (63%) patients were female and the median age was 52 years.

As 494 patients were positive for anti-HCV, and the overall prevalence was 1.7%. The anti-HCV prevalence of different age groups was shown in Table 1, which increased from 0.2% in the age group of 0-9 to 2.6% in the age group of 60-69. The differences were statistically significant ($P < 0.001$). Anti-HCV prevalence among 11 172 male patients was 2%, and the prevalence was 1.4% among 18 724 female patients, the differences were statistically significant ($P < 0.001$).

Anti-HCV prevalence among patients from non-surgical departments was 3%, significantly higher than that of surgical departments (1%) and that

of populations undergoing routine medical check (1.8%). Among patients of non-surgical departments, those from outpatient services had higher anti-HCV prevalence than those from inpatients services (4.4% vs. 1.8%, $P < 0.001$). However, among patients of surgical departments, those from outpatient services had lower anti-HCV prevalence than those from inpatients services (0.8% vs. 1.3%, $P < 0.001$).

Among patients with positive anti-HCV, 194 (39.3%) was tested for HCV RNA. The results showed that HCV RNA of 113 (58.2%) patients were higher than the low detection limit.

DISCUSSION

This study showed that prevalence of HCV infection among patients of general hospitals could be relatively high. From July 2008 to July 2009, 1.7% of the patients tested for anti-HCV were anti-HCV positive. Elderly age groups, particularly those of 60-69 years old had the highest infection rate. This age specific trend was also seen in a large scale epidemiology survey among general population in six regions in China, with a lower overall prevalence. We speculate that this result is due to the increased HCV exposure with age and the chronic nature of HCV infection. Since HCV was identified in 1989, blood donor screening for HCV has reduced the incidence of iatrogenic transmission through blood transfusion, transplantation, and nosocomial infections resulting from inadequately sterilized equipments.⁴

Our study identified other factors related to HCV infection in this population. Non-surgical departments had higher infection rate than surgical departments. The incidence of HCV infection was higher in male patients compared to female patients (2% vs. 1.4%). This result was different from that of general population reported by 2007 national survey, where HCV prevalence was 0.68% in women and 0.49% in men. That might because of the relative small sample size of our study and selection bias. Our study provided additional bases for evaluating the risk of occupational exposure. After acute infection, chronic infection develops in the majority of people (50% - 85%) after exposure. The risk of cirrhosis ranges from 5% to 25% over 25 - 30 years after infection.⁵ Environmental and host factors can increase the risk and/or accelerate the natural course of HCV-related disease. Multiple studies have shown that alcohol consumption is one of the most influential

Table 1. Anti-HCV prevalence in different age groups

Age	Tested number	Positive number	Positive ratios (%)
0-9	414	1	0.2
10-19	1 303	22	1.7
20-29	4 042	48	1.2
30-39	6 617	74	1.1
40-49	5 532	82	1.5
50-59	5 243	102	1.9
60-69	3 606	93	2.6
70-79	2 628	62	2.4
≥80	511	10	2
In total	29 896	494	1.7
<i>P</i> value			< 0.001

Table 2. Anti-HCV prevalence in different departments

	Outpatients	Inpatients	<i>P</i> values	Total
Surgical department (n=20428)	100/11849 (0.8%)	112/8579 (1.3%)	=0.001	212/20428 (1%)
Non-surgical department (n=9300)	192/4413 (4.4%)	87/4887 (1.8%)		279/9300 (3%)
Health examination center			< 0.001	3/168 (1.8%)
<i>P</i> value				<0.001

factors driving fibrosis progression in patients with HCV. Age at time of infection also plays a role: the estimated probability of progression is significantly higher in patients who were infected at an older age (> 40 years).⁶ A recent analysis of published studies suggested that early acquisition of HCV in childhood is rarely associated to a severe future course of the disease.⁷ Other factors that influence the progression of hepatic fibrosis include gender, the degree of inflammation and fibrosis on the liver biopsy, comorbidities such as immunosuppression, metabolic condition such as non-alcoholic steatohepatitis, obesity and insulin resistance.⁸ Additionally, co-infection with HBV or HIV is a risk factor for liver fibrosis. HCV infection is also associated with changes in the host immune system, which leads to immunological abnormalities and even autoimmune disease such as mixed cryoglobulemia (MC), or B cell lymphoproliferative disorders that may progress to non-Hodgkin lymphoma. As HCV infection results in severe consequences to patients and brings up heavy burden for the society, proper prevention measures to reduce transmission are crucial.

In our investigation, HCV RNA was detectable among 58.2% of patients with positive anti-HCV,

which indicated increases risk of nosocomial transmission. Medical workers who may have occupational exposures should be trained to strengthen prevention measures. Patients with higher HCV RNA copies should be given anti-viral therapy as soon as possible, particularly treatment-naïve patients with compensated diseases. Treatment should be initiated promptly in patients with advanced fibrosis (METAVIR score F3–F4), and this treatment should be strongly considered to use in patients with moderate fibrosis (METAVIR score F2). In patients with less severe disease, therapy is individualized.⁹ Despite the importance of HCV RNA testing, only 39.3% patients who have positive anti-HCV were tested for HCV RNA in our study. Similar situation has been reported elsewhere. A survey showed that approximately one half of persons newly reported with HCV infection did not have a HCV RNA test.¹⁰ A separate analysis of surveillance data reported that 47.3% of persons with positive HCV antibody did not have HCV RNA test results during 2006-2007.¹¹ A multisite cohort study of patients with chronic viral hepatitis revealed that 37.7% of 9 086 patients with a positive HCV antibody test during 2006-2008 had no documented follow-up testing for HCV RNA.¹²

Therefore, awareness of HCV RNA detection should be raised in medical practitioners.

There are some limitations in this study. With retrospective analysis, we were unable to obtain additional information to further reduce confounding bias or evaluate selection bias. Because all samples were from a single center, the representativeness of this finding needs to be verified by future studies.

In conclusion, in this large scale cross-sectional analysis, it is found that the HCV prevalence among patients who visit this general hospital were considerably high. In addition, older age, male and patients in non-surgical department were risk factors of HCV infection. This study provided additional data for evaluating the risk of occupational exposure, and suggested that medical workers who may have occupational exposures to certain groups of patients should be trained to strengthen prevention measures.

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