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# The serological prevalence and risk factor analysis of hepatitis G virus infection in Hubei Province of China

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**Subject headings** hepatitis G virus; enzyme linked immunoabsorbent assay; risk factors; polymeras e chain reaction; prevalence; transcription, genetic

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## INTRODUCTION

Hepatitis G virus (HGV),also known as GB virus C, is a recently cloned virus which may be associated with human non A-E hepatitis[1,2]. It is parenterally transmitted and usually coinfected or superinfected with hepatitis B or hepat itis C virus[3-5]. Some investigations have been reported on the serop revalence and molecular prevalence of HGV infection in different areas and diffe rent population[6-15]. Current infection of HGV is diagnosed by detectio n of HGV RNA, and past infection with HGV is detectable by testing anti-HGV env elope protein (E2)[16-17]. To investigate the prevalence of HGV in Hubei Province, a central area of the People's Republic of China, ELISA and RT - PCR were employed to detect serum anti-HGV and HGV RNA in 1516 patients who were divided into 16 groups.

## MATERIALS AND METHODS

### *Samples*

One thousand five hundred and sixteen serum samples were obtained from 16 groups in Hubei Province, including 299 drug users (19.72%), 98 prostitutes (6. 46%), 504 blood donors (33.25%), 61 hemodialysis patients (4.02%), 351 cases with viral hepatitis (23.15%), 41 with primary hepatocellular carcinoma (PHC, 2.70%), 51 with hemopathy (3.36%), 53 renal transplant recipients (3.49%) and 3 liver trans plant recipients (0.20%). 55 freshmen, nurses and doctors (3.63%) were employed as healthy controls.

### *Reagents and detecting methods*

Serum HBV markers, HAV IgM, HEV IgM, and anti-HCV were detected by enzyme linked immunoabsorbent assay (ELISA). Anti-HGV was also detected by ELISA and the tes t kits were procured from Wantai Biological Preparation Co Ltd, Beijing. HGV RNA was assayed by reverse transcript polymerase chain reaction (RT-PCR) with the primers of 5'-UTR, and the kits were purchased from the Center of Hepatitis R ea gents, Beijing. Both anti-HGV and HGV RNA were simultaneously measured in the drug users, prostitutes, and healthy subjects. For other groups, HGV RNA was dete cted only when their anti-HGV was positive due to insufficient outlay.

### *Data statistics*

All data were analyzed by means of the Chi-square test.

## RESULTS

### *HGV infections in drug users and prostitutes*

The positive rates of anti-HGV and HGV-RNA in drug users were 9.06% (34/375) and 27.20% (102/375); those in prostitutes were 38.77% (38/98) and 20.41% (20/98). The analysis of risk factors of HGV infections in drug users and prostitutes is listed in Tables 1 and 2.

**Table 1 Positive rates of anti-HGV and HGV RNA in drug users and prostitutes**

| | *n* | Anti-HGV | HGV RNA |
|---|---|---|---|
| Drug users* | | | |
| po | 211 | 6.63 (14) | 27.96 (49) |
| iv | 164 | 12.20 (20) | 32.92 (54) |
| Prostitutes | | | |
| Non-addict | 22 | 9.09 (2) | 13.36 (3) |
| Addict | 76 | 14.43 (36) | 22.36 (17) |
| Healthy group | 55 | 1.82 (1) | 0 (0) |

*Seventy-six prostitutes who were addicted to drugs were added to this g roup.

The positive rate of HGV RNA in intravenous drug users (IVDU) was higher than in oral users ($\chi^2 = 4.36$, $P < 0.05$). The positive rates of anti-HG V in the p rostitutes who were addicted to drugs were higher than those who were not ($\chi^2 = 12.19$, $P < 0.01$).

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**Table 2 Risk factors of HGV infections in drug users**

| | Sex | | Addiction duration | | HBV infection | |
|---|---|---|---|---|---|---|
| | Male | Female | < 2 years | ⩾2 years | HBsAg (+) | HBsAg (-) |
| Anti-HGV | 8.65 | 9.23 | 6.48 | 12.58 | 13.33 | 9.37 |
| HGV RNA | 3.46 | 32.84 | 9.72 | 52.56 | 16.67 | 22.78 |

The statistical difference of anti-HGV positive rate was tested between users a ddicted for more than 2 years and users for less than 2 years ($\chi^2$ = 4.29, $P$ < 0.05). The positive rate of HGV-RNA in female users was higher th an that in mal e users($\chi^2$ = 11.55, $P$ < 0. 01), that in the patients who were addicted for more t han 2 years was also higher than those addicted for less than 2 years ($\chi^2$ = 79.06, $P$ < 0.01).

### *HGV infections in blood donors*

Seven percent (29/417) of blood donors were found to be anti-HGV positive and 27.5% anti-HGV positive donors were detected to be HGV RNA positive.

### *HGV infections in the cases of PHC, hemodialysis, liver or kidney transplanta tion (Table 3)*

**Table 3 HGV infections in the cases of PHC, hemodialysis, liver or kidney tran splantation**

| | *n* | Anti-HGV | HGV RNA in anti-HGV (+) cases |
|---|---|---|---|
| Hemodialysis | 61 | 13.11 (8/61) | 37.50 (3/8) |
| PHC | 41 | 4.80 (2/41) | 100.00 (2/2) |
| Liver transplantation | 3 | 33.30 (1/3) | 100.00 (1/1) |
| Kidney transplantation | 53 | 1.82 (1/53) | 0 |
| Total | 158 | 7.5 (12/158) | 50.00 (6/12) |

### *HGV infections in the patients with hemopathy*

Anti-HGV was detected in 6 (11.7%) out of 51 cases with hemopathy, among them, 4 cases with acute or chronic leukemia, one with aplasia anaemia and one with leukopenia. No HGV RNA was assayed in six anti-HGV positive cases.

### *HGV infections in the patients with viral hepatitis (Table 4)*

**Table 4 Positive rates of anti-HGV and HGV RNA in patients with viral hepatitis**

| | *n* | Anti-HGV | HGV RNA in anti-HGV (+) cases |
|---|---|---|---|
| Hepatitis A | 35 | 14.29 (5/35) | 20.00 (1/5) |
| Hepatitis B | 214 | 17.29 (37/214) | 35.14 (13/37) |
| Hepatitis C | 62 | 14.52 (9/62) | 55.56 (5/9) |
| Hepatitis E | 25 | 4.00 (1/25) | 0 |
| Hepatitis NA-E | 15 | 26.67 (4/15) | 50.00 (2/4) |
| Total | 351 | 15.05 (56/351) | 37.50 (21/56) |

The positive rates of anti-HGV and HGV RNA did not correlate with the sex, age, duration, and severity of diseases. The mean levels of ALT and T-Bil in patients with hepatitis B whose anti-HGV was positive were higher than those whose anti-HGV was negative.

## DISCUSSION

HGV is a new pathogenic agent which was discovered in 1995, its genome structur e resembles other flaviviruses containing a positive, single plus-strand RNA[1,2]. It has been demonstrated that the distribution of HGV is global [1,2,6-14]. The transmission route of HGV is similar to that of HBV and HC V[1,3,4,11,12]. The investigation on HGV infection rates in Hubei Province of China showed that the infection rates of HGV in cases with viral hepatitis , hemodialysis, hemopathy, transplantation, intravenous drug users (IVDU) and prostitutes were 15.05%, 13. 11%, 16.7%, 9.1% and 14.43%, higher than that in h ealt hy controls (1.82 %). The result indicate that HGV infection is common in China .

The infection rate of HGV in drug users varies widely on different documents with a range from 23.8% to 77.4%[7,18-20]. However, there is no contr ov ersy regarding the fact that drug addiction is a high risk factor for HGV infect ion. We found that the positive rate of HGV RNA in IVDU was higher than that in oral drug users (12.82% vs 2.97%, $P$ < 0.05). This suggests that the un sterilized injections contribute to HGV transmission among IVDU.

It is known that sexual contact is a common route for horizontal transmission of HBV, HCV and HDV. Recently, sexual transmission of HGV has been demonstrated[18,21-25]. Our survey found that most of the prostitutes were also addicted to drugs, this may be one of reasons that they had a high HGV infection rate . HGV infection was found in 15.05% of patients with viral hepatitis. This is much higher among the blood donors in the same geographic area. However, there may be bias in this statistical inference, since blood donors who are found to be positive for HBsAg or for anti-HCV through screening programs are told not to donate blood. Thus, the low prevalence of HGV infection may represent a selection bias. This viewpoint was demonstrated by Handajani *et al*[14].

No agreement has been reached on the pathogenicity of HGV. Most of the recent in vestigations show that HGV infection in patients with hepatitis B and hepatitis C is not associated with any changes in indices of liver diseases, including se rum ALT level, Knodell score or histology activity index (HAI)[25-28], and the consequences of hepatitis[27,29]. However, some reports inclu ding this paper found that HGV infection was associated with liver damage, even fulminant hepatitis [31,32]. So further prospective studies are needed to demonstrate its relative significance in causing hepatitis and other diseases.

High infection rates of HGV were also discovered in patients with hemodialysis, PHC, and transplantation. This result may be associated with the more transfusions received by these cases than healthy persons.

A conclusion which can thus be drawn from this study

is that HGV infection is co mmon in this area, and the drug users, prostitutes, transplant recipients, blood donors, patients with hemopathy, hemodialysis, and liver diseases are high risk groups for HGV infection.

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