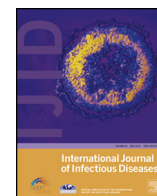


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Hepatitis E virus seroprevalence among blood donors in Jiangsu Province, East China



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SUMMARY

Objective: Hepatitis E virus (HEV) infection is responsible for over 50% of acute viral hepatitis cases, and the blood transfusion route has emerged as a possible means of sporadic HEV infection. The aim of this study was to determine the seroprevalence of HEV among blood donors in East China.

Methods: Blood samples were collected consecutively between January and June 2011 from 486 blood donors living in Jiangsu Province, East China. Anti-HEV IgG was tested by ELISA.

Results: One hundred and thirteen blood donors developed HEV IgG antibody, indicating the prevalence of HEV IgG seropositivity to be 23.3%. HEV IgG seropositivity was 25.3% (90/356) in the male group, significantly higher than that in the female group (17.7%, 23/130) ($p < 0.05$). The donors who had donated more than 10 times had significantly higher HEV IgG seropositivity than the other groups ($p < 0.05$). Furthermore, donors aged 50–55 years had significantly higher HEV IgG seropositivity than the other age groups ($p < 0.05$).

Conclusions: We investigated HEV seroprevalence among blood donors in East China. Our data will help identify the risk factors for HEV infection and provide guidance on controlling the safety of blood transfusions in the clinical setting.

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1. Introduction

Hepatitis E virus (HEV) infection is responsible for over 50% of acute viral hepatitis cases and has become an important public health concern worldwide. Hepatitis E is most common in developing countries with inadequate water supplies and environmental sanitation, and large hepatitis E epidemics have been reported in Asia, the Middle East, Northern and Central Africa, and Central America. However, sporadic HEV infection has been reported in developed countries, including the USA and European countries.^{1–4} Recently, the blood transfusion route has emerged as a possible means of sporadic HEV infection in several countries.^{5–7}

HEV immunoglobulin G (IgG) prevalence ranges between 3% and 20%, and the reliability of HEV IgG seropositivity enzyme-linked immunosorbent assay (ELISA) kits has been proved.⁸ China

is a large country with a large population of blood donors. While several studies have reported the prevalence of HEV infection in different groups in China,⁹ the prevalence of HEV infection in blood donors in China remains unclear. Therefore, the aims of this study were to investigate whether HEV could be transmitted by the blood transfusion route and to analyze the seroprevalence of HEV strains among blood donors in Jiangsu Province in East China.

2. Methods

2.1. Population and sample collection

This study was approved by the Ethics Committee of Nanjing Medical University and all participants gave informed consent. A questionnaire was completed for each participant to collect information on age, sex, and history of blood donation. Blood samples were collected consecutively between January and June 2011 from 486 blood donors living in the regions of Huai'an and Lianyungang, Jiangsu Province, East China, comprising both urban

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and rural areas. In order to investigate a population close to the general population, blood collections at university campuses or army centers were excluded.

2.2. Detection of antibodies against HEV

Serum samples were tested by ELISA for IgG, as described previously.¹⁰ HEV antibodies were detected by adding 100 μ l of horseradish peroxidase-labeled monoclonal anti-human IgG (Pierce, USA) appropriately diluted in phosphate buffered saline-Tween with 1% non-fat milk followed by incubation for 30 min at 37 °C. The antibody complexes were detected by the addition of 100 μ l orthophenylenediamine (Abbott, USA) for 10 min for HPRO-labeled antibodies. The cut-off was statistically established as the mean of the optical density (OD) value at 492 nm. All participants had been tested for hepatitis B surface antigen (HBsAg) and antibodies to hepatitis C virus (anti-HCV) by ELISA before blood donation, and the information was collected from the blood transfusion center.

2.3. Statistical analysis

Data were expressed as the mean \pm standard deviation and were analyzed using SPSS version 12 software (SPSS Inc., Chicago, IL, USA). A *p*-value of <0.05 was accepted as statistically significant.

3. Results

In this study we enrolled 486 blood donors, including 356 (73.3%) males and 130 (26.7%) females. Their age ranged from 22 to 55 years (mean 43 \pm 6 years). The ELISA assay showed that 113 blood donors developed HEV IgG antibody, indicating the prevalence of HEV IgG seropositivity to be 23.3%.

Next we analyzed the prevalence of HEV IgG seropositivity in the 486 blood donors. In the male group, HEV IgG seropositivity was 25.3% (90/356), significantly higher than that in the female group (17.7%, 23/130) (Table 1, *p* < 0.05). Of note, the percentage of HEV IgG seropositivity increased with the number of times blood was donated. Those donors who had donated more than 10 times had significantly higher HEV IgG seropositivity than the other groups (Table 1, *p* < 0.05). Furthermore, the percentage of HEV IgG seropositivity increased with the age of the blood donors. Those donors aged between 50 and 55 years had significantly higher HEV IgG seropositivity than the other age groups (Table 1, *p* < 0.05).

Furthermore, we analyzed the correlation between HEV infection and hepatitis B virus (HBV) or hepatitis C virus (HCV) co-infection in blood donors. The results showed that the percentages of HBsAg seropositivity and HCV antibody seropositivity were slightly higher in donors with HEV IgG seropositivity than in those with HEV IgG seronegativity, but there were no significant differences (Table 2, *p* < 0.05).

Table 1
Prevalence of HEV IgG seropositivity in blood donors (*n* = 486)

Characteristic		HEV positive IgG	<i>p</i> -Value
Sex	Male	90/356 (25.3%)	0.011
	Female	23/130 (17.7%)	
Number of times a donation had been made	<5	44/245 (18.0%)	
	5–10	40/156 (25.6%)	0.213
	\geq 10	29/85 (34.1%)	0.005
Age, years	<40	5/42 (11.9%)	
	40–50	47/246 (19.1%)	0.285
	50–55	61/198 (30.8%)	0.017

HEV, hepatitis E virus.

Table 2

Correlation between HEV infection and HBV or HCV co-infection in blood donors

Characteristic	HEV positive IgG (<i>n</i> = 113)	HEV negative IgG (<i>n</i> = 404)	<i>p</i> -Value
HBsAg seropositivity	8 (9.76%)	37 (9.16%)	0.845
HCV antibody seropositivity	5 (6.10%)	23 (5.69%)	0.893

HEV, hepatitis E virus; HBV, hepatitis B virus; HCV, hepatitis C virus; HBsAg, hepatitis B surface antigen.

4. Discussion

Transfusion-transmitted infections are a major problem associated with blood transfusion. While many studies have investigated the prevalence of HIV, HBV, and HCV infection in blood donors, only recently has the prevalence of HEV infection in blood donors been examined.^{5–8} In this study, we screened 486 blood samples from blood donors in East China and found the HEV seroprevalence to be 16.9%; this rate is significantly higher than the 4.9% recently reported in blood donors in southwest Switzerland,⁷ but is close to the rate reported by Ijaz, who conducted a retrospective screening study comparing seroprevalence rates in blood samples taken in 1991 and 2004 and found similar rates among the two groups (13.0% in 1991 and 13.5% in 2004).¹¹ Our rate is significantly lower than the rate of 22.7% reported in illegal blood donors in central China.¹² This is reasonable because illegal blood donors have a greatly increased risk of HEV infection.

Age has been shown to be a risk factor for HEV infection, and older age is correlated with HEV antibody seropositivity.¹³ Consistent with previous studies, we found that the percentage of HEV IgG seropositivity increased with the age of the blood donors in the current study. For those donors aged between 50 and 55 years in particular, HEV IgG seropositivity was significantly higher.

Sex may be another risk factor for HEV infection because we found that 25.3% of male blood donors were HEV seropositive compared to 17.7% of female donors. These data are consistent with those of a previous study showing higher prevalence of anti-HEV reactivity in male than in female blood donors in Iran.⁶ Thus it appears that male blood donors are more likely to become infected by HEV than female donors.

Blood donors are generally healthy, without any recent history of hepatitis or other illness.¹⁴ In this study we found that the percentage of HEV IgG seropositivity increased with the number of times blood was donated. In particular, the donors who had donated more than 10 times had significantly higher HEV IgG seropositivity than those who had donated fewer times. Although we found no significant correlation between HEV seropositivity and blood-borne hepatitis viruses such as HBV and HCV, these data suggest that frequent blood donation may increase the risk of HEV infection, because HEV can be transmitted via similar or overlapping routes as HCV.¹⁵

Due to the limitations of available resources, we only detected blood donors in two regions of Jiangsu Province, East China in this study. Further efforts are needed to increase the sample size and regions involved.

In conclusion, this is the first study to investigate HEV seroprevalence among blood donors in East China. Our results demonstrate that HEV infection is prevalent in this population. Males, individuals aged more than 50 years old, and individuals who have donated blood more than 10 times are more likely to be HEV-seropositive. These data will help identify the risk factors for

HEV infection and provide guidance on controlling the safety of blood transfusions in the clinical setting.

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Conflict of interest: The authors declare that they have no competing interests.

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