



## Short Communication

# HBV and HCV Seroprevalence in Hospital Admissions for Thalassemia Major in Bengbu, China

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### ABSTRACT

Patients with thalassemia major are exposed to a wide range of blood transition viruses that among them hepatitis B and C viruses are in high significance. This study investigates the seroprevalence of HBV and HCV in hospital admissions for thalassemia major in Bengbu, China. This study is a cross-sectional study in which information was extracted and collected from patients' records, including gender, age, number of blood transfusions per year, HBs-Ag, HCV-Ab and Anti-HBs. The study included 630 thalassemia major patients who received regular blood transfusions at a hospital in Bengbu, China. We found that out of 630 patients of the study, there were three HBs-Ag positive, so the prevalence of HBV in this study is 0.5%. The prevalence of HCV-Ab positive was 7.1 and these individuals had a significantly older mean age than those with HCV-Ab negative. In 89.8% of patients the HBs-Ab titer was more than 10. Due to the progress of screening and selection of blood donors the prevalence of HBV infection in high-risk patients has sharply decreased in recent years. Vaccination is one of the most important protective factors in this group of the population. Therefore, administration of a reminder dose based on antibody titer is recommended in these individuals.

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### Authors' Contribution

JZ collected the samples. XX analysed the data. MC conducted the experiments and analysed the results. All authors discussed the results and wrote the manuscript.

### Key words

HBV, HBs-Ag, Blood transition, Thalassemia, Seroprevalence

Thalassemia was diagnosed by Thomas Cooley in 1925, and was named Mediterranean anemia because of its prevalence along the Mediterranean coast. This disease is hereditary and is associated with hypochromic anemia, which has more severe clinical symptoms in the major type (homozygous) than in the minor one (heterozygous) (Weatherall and Clegg, 1981). Due to the frequent transfusions that are necessary for the survival of the patients, there is a chance of developing hepatitis B in these individuals. Every year, 4 to 5 out of every 1,000 thalassemia patients develop viral hepatitis (Daryani *et al.*, 2003). In addition to increasing the risk of hepatocellular carcinoma and liver cirrhosis, HBV infection change into chronic one in 60% of cases and the likelihood of transmission and diffusion in the community increases (Daryani *et al.*, 2003; Mandell and Bennett, 2005). The most effective active immunity against hepatitis B is

vaccination before exposure to the virus. According to the level of Anti HBS, serum is divided into two categories: good response (more than 100 IU / ml) and bad response (less than 10 IU / ml). Serum Ab level usually rises after vaccination and remain high for a long time, but in 50% of individuals the Ab level does not rise which requires re-vaccination.

Routine HBV vaccination for all infants at birth and all children and adolescents under 18 who have not previously received it is necessary. There is an indication that special attention is paid to people such as dialysis patients, recipients of concentrated coagulation factors, gays, residents of care centers for the disabled, injecting drug users, prisoners and health center staff. Patients with beta thalassemia major respond less to the vaccine due to iron overload, so estimating the immune response in people who need a blood transfusion is of a great importance (Kliegman, 2012; Chirico *et al.*, 2015).

Hussein (2014) studied the prevalence of hepatitis B, C, and HIV in 200 children with thalassemia major in order to assess the reliability of blood products in Egypt. Of the 96 males and 104 females with a mean age of 9.2 ± 4.5 years, 6 (3%) were HBs-Ag positive and 48 (24%) were HCV positive and among them 4 were HBs-Ag positive. None of them were HIV-Ab positive. Makroo *et al* in a study performed in 2011-2012 on all thalassemia

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patients referred to a hospital in northern India. Of the 462 patients, 290 were male and 172 were female. 13 patients (2.8%) were HBs-Ag positive, 107 patients (23.1%) were anti-HCV positive and 11 patients (2.38%) were anti-HIV positive.

Blood product screening for HIV and HCV infections has been mandatory in India since 1989 and 2001, respectively, while HBV screening has been started since the early 1980s. However, the prevalence of these viruses in this area is so high. All in all, evidence concerning prevalence of HBV in patients with thalassemia major is weak.

Today, with the increasing prevalence of infectious diseases transmitted through blood and blood products such as hepatitis and AIDS, concerns about the rising prevalence of these diseases among different groups of patients, including patients who may need these blood products in their treatment are increased. One of the high-risk groups is patients with thalassemia major who require blood transfusions and blood products in the course of their disease, which is a risk factor for these patients. As mentioned before, the response to the vaccine in case of not receiving a reminder dose is lower in this group of patients than in healthy individuals, which increases the risk of developing HBV in these people. However, in recent years with the development and application of health guidelines for vaccination and screening, prevalence of HBV in this group of people has greatly decreased. Concerning the fact that the prevalence of HBV in Bengbu, China, which covers over 700 patients requiring frequent blood transfusions has not been studied so far, purpose of this study on one hand was to determine the status of HBV seroprevalence in hospital admissions for thalassemia major in Bengbu, China during 2018-2019 and on the other hand to evaluate the rate of response to vaccine as well as the rate of prevalence of HCV and HBV infection in this group of patients.

#### *Materials and methods*

In this cross-sectional study, the study population included all patients with thalassemia major referred to Bengbu Hospital in China during the years 2018 to 2019. The study sample consisted of 630 patients with thalassemia major eligible for the present study who were selected by census sampling.

Inclusion criteria for the study were all patients with thalassemia major referred to Bengbu Hospital in China from 2018 to 2019, whose case information was complete and they did not have hepatitis B before the blood transfusion. Also, people who had hepatitis B before the start of the blood transfusion and patients who died during the study were excluded from the study. Vaccination response rate based on antibody titer (HBs-Ab) is defined in two ways: titer greater than 10 IU / ml as a complete

response and titer less than 10 IU / ml as an incomplete response to the vaccine. In this study, SPSS-22 software, t-test and Chi-square tests, descriptive statistics, central indices and dispersion were used for analysis. Patient information was recorded completely confidential and all information of the patient was confidential and was not made available to any natural or legal entity. The conditions of the study were described to the subjects and their consent was obtained and no additional costs were imposed on the patients.

#### *Results*

Out of 630 patients, 319 (50.6%) were female and 311 (49.4%) were male. The age range was 6-67 and the mean age was  $31.05 \pm 7.61$ . Also, most of the people were in the age group of 26-35. The average number of visits for blood transfusion in the whole sample is  $10.88 \pm 5.8$ . The results of [Table I](#) show that 529 patients (84%) had Rh positive blood type and 101 patients (16%) had Rh negative blood type. In ABO blood group, the highest prevalence belongs to group O (35.7%).

HBs-Ab titer was divided into two groups, including greater than 10 (IU / ml) as adequate response and less than or equal to 10 (IU / ml) as non-vaccine response and requiring reminder dose. Of the 630 thalassemia major patients who required frequent blood transfusions, 566 (89.8%) had adequate response and only 64 (10.2%) individuals had antibody levels less than 10 (IU / ml). three (0.9%) women aged 26 to 35 years were HBs-Ag positive and 45 patients (7.1%) including 19 men (6.1%) and 26 women (8.1%) were HCV-Ab positive as well.

[Table II](#) shows a comparison of HBV antibody responses by mean age, mean number of blood transfusions per year, gender, and HBs-Ag status. Examining this table, we find that out of 566 patients (89.8%) with antibody titers greater than 10 (IU / ml), 281 (90.3%) were male and 285 (89.3%) were female. On the other hand, in the group of patients with a titer less than or equal to 10 (IU / ml), 30 (9.6%) were male and 34 (10.6%) were female. The results of mean age in the two groups with t-test showed that individuals with antibody titers greater than 10 are significantly younger than the other group ( $p = 0.03$ ). The mean age of individuals with a titer greater than or less than 10 (IU / ml) was  $31.11 \pm 7.12$  and  $42.12 \pm 9.21$ , respectively. Also, one patient (0.2%) had HBs-Ag positive with HBs-Ab titer greater than 10 (IU / ml) and 2 patients (3.1%) had HBs-Ag positive with HBs-Ab titer less than 10 (IU / ml). The mean number of blood transfusions in two groups of patients with antibody levels less than and more than 10 (IU / ml) in the table above shows that these two values were not significantly different between the two groups and this difference was not statistically significant ( $p = 0.09$ ).

**Table I. Demographic information of participants.**

%	n	Variable
<b>Gender</b>		
Female	319	50.6
Male	311	49.4
<b>Age (year)</b>		
<12	35	5.6
12-25	135	21.4
26-35	220	34.9
36-45	159	25.3
46-55	49	7.8
56-65	18	2.8
66-75	14	2.2
<b>Rh group</b>		
Positive	529	84
Negative	101	16
<b>Blood type</b>		
A	162	25.7
B	188	29.8
O	225	35.7
AB	55	8.7
<b>HBs-Ag titer (IU/ml)</b>		
>10	566	89.8
≤10	64	10.2

Table III shows the comparison of the frequency and percentage of HBs-Ag and HCV-Ag titers by age groups of patients in this study. In the table above, antibody titers against hepatitis B virus surface antigen and also HCV infection status were compared in different age groups.

Examining this table, we find that in older age groups, the percentage of people who had an antibody titer greater than 10 (IU / ml) decreases. Similarly, with increasing of age the percentage of HCV infection in these patients increases that these results were statistically significant.

Table IV shows a comparison of HCV-Ag status by number of injections, gender, and mean age. Examining this table, we find that 45 patients including 19 (6.1%) males and 26 (8.1%) females were HCV-Ag positive, no difference concerning gender ( $p > 0.05$ ) was observed. The mean age was  $42.2 \pm 5.12$  in infected individuals and  $31.4 \pm 4.66$  years in healthy ones. Mean age in HCV-Ag

positive individuals was significantly higher than healthy individuals ( $P < 0.05$ ). The mean of referrals for blood transfusion in HCV-Ag positive and negative patients was  $14.25 \pm 4.7$  and  $5.34 \pm 10.13$ , respectively. Although HCV patients had more transfusions, this relationship was not significant ( $P = 0.6$ ).

#### Discussion

Despite the use and development of accurate HBV screening methods using modern equipment and the implementation of these methods by blood transfusion centers in various countries, including China, cases of hepatitis B after blood transfusion are still reported. In the present study, out of 630 patients with thalassemia major, three were HBs-Ag positive and 45 were HCV-Ag positive, with a prevalence of 0.5% and 7.1%, respectively. There wasn't any significant relationship between the number of injections and HBs-Ag and HCV-Ag positivity. Also, 89.8% of subjects had antibody titers above 10 IU / ml, which is consistent with previous studies (Sharifi *et al.*, 2010; Rehman *et al.*, 2012; Azarkeivan *et al.*, 2009).

In the present study, frequency of people with HCV were higher in older age groups. The mean age of these patients was higher than the other group, which has been confirmed in previous studies (Covas *et al.*, 1993). For example, a study in the United States in 2004 showed that the prevalence of HCV positive was significantly correlated with the age of patients. This may be because these patients have received blood or blood products for a longer period of time and were more likely to be exposed to the contamination of unscreened blood.

The results of this study showed that 35 patients (36.4%) were HBV-DNA positive while only one of these patients was HBs-Ag positive. In frequency of latent HBV infection in the two groups of complete and incomplete response to the vaccine was not any difference, which is in line with previous studies (Sabat *et al.*, 2015).

Sabat *et al.* (2015) conducted a study on 174 patients in 2015 to investigate latent HBV infection in patients with transfusion-dependent thalassemia. The results of their study showed that one patient (0.5%) was HBs-Ag positive, 38 patients (21.8%) were HBc-Ag positive, 53 patients (30.4%) were HBs-Ag positive and 6 patients were (3.4%)

**Table II. Comparison of HBV antibody titer response (IU/ml) by mean age, mean number of blood transfusions per year, sex and status of HBs-Ag.**

Age	Frequency of injections	Age (Mean± SD, year)	Gender (n, %)		HBs-Ag (n, %)	
			Male	Female	Positive	Negative
>10	10.87±1.22	31.11±7.12	28(90.3)	285(89.3)	1 (0.2)	565 (99.8)
≤10	10.89±1.57	42.12±9.21	30(9.6)	34(10.6)	2(3.1)	62(96.9)

**Table III. Comparison of frequency and percentage of HBs-Ab and HCV-Ab titers by age groups.**

HCV-Ab		HBs-Ab titer (IU/ml)		Age (year)
Negative	Positive	≤10	>10	
34 (97%)	1 (3%)	1 (1%)	34 (99%)	<12
131 (97%)	4 (3%)	7 (5%)	128 (95%)	12-25
208 (94.6%)	12 (5.4%)	13 (6%)	207 (94%)	26-35
144 (90.6%)	15 (9.4%)	20 (13%)	139 (87%)	36-45
40 (82%)	9 (18%)	10 (20%)	39 (80%)	46-55
15 (83.4%)	3 (16.6%)	5 (28%)	13 (72%)	56-65
13 (92.9%)	1 (7.1)	8 (57%)	6 (43%)	66-75
585	45	64	566	Total

**Table IV. Comparison of HCV-Ab status by number of injections, sex and mean age.**

Age (Mean±SD, year)	Gender (n, %)		HCV-Ab	Frequency of injections (Mean, year)
	Male	Female		
42.5±5.12	19 (6.1%)	26 (8.2%)	Positive	14.25±4.7
31.4±4.66	292 (93.9%)	293 (91.8%)	Negative	5.34±10.13

HCV-Ab positive. Also in their results, HBV-DNA was positive in 9 patients (15%), and 50% of people who were only HBc-Ab positive were HBV-DNA positive as well.

One of the limitations of this study is that it is a retrospective study and its working method is file reading, which causes the exclusion of some samples due to information deficiencies. Another limitation of the present study is that the information available in patients' records is qualitative as well as the lack of information about HBc-Ab, because in recent studies much attention has been paid to the latent HBV infection (OBI). Present study suggests that further studies be performed by performing HBV-DNA and HBc-Ab tests, as well as estimating the prevalence of HBV in other patients requiring frequent blood transfusions, such as those with hemophilia or thalassemia cycle.

Transfusion-transmitted infections are one of the most important problems in patients with thalassemia major. Estimating the prevalence of these infections, especially HBV, we can be aware of the results of disease prevention strategies, look for causes of them and think of new solutions to solve this problem. In the present study, the prevalence of HBs-Ag positive in thalassemia patients admitted to Bengbu Hospital in China was 0.2% and 89.8% of patients had a HBs-Ab titer of more than 10, indicating that the majority of participants had good vaccination coverage.

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#### Statement of conflict of interest

The authors have declared no conflict of interest.

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