

Original Article

AntiHBc (total) As a Screening Assay for Safety of Donated Blood.

M Z Rahman¹, M R Alam², S Parveen³, D S Ahmed⁴, M A Rahman⁵, M S Chowdhury⁶, M A Rana⁷, H Masud⁸**Abstract:**

Detection of hepatitis B surface antigen (HBsAg) in blood is diagnostic for hepatitis B virus (HBV) infection. In blood bank, screening for HBsAg is carried out routinely to detect HBV infection. Despite this, transfusion-associated HBV infection still occurs due to presence of occult HBV infection. The aim of this study was to detect occult HBV infection among the HBsAg negative/ Anti-HBc(total) positive donor. A total of 52 patients negative for HBsAg, but positive for Anti HBc(total) were included in this study. All the patients were then investigated for determination of Anti-HBs titre and HBV-DNA (PCR). Out of 52 patients, HBV DNA was detected in 16 patients (8.32%). Overall, 18 patients (9.36%) out of 52 were found positive for AntiHBs antibody. Among antiHBs positive patients, who are supposedly protected against HBV infection, 6 (33.33%) patients had detectable HBVDNA. In conclusion, a considerable number of HBV infected donors remain undiagnosed, if only HBsAg is used for screening. Addition of AntiHBc(total) testing for donor screening will definitely eliminate HBV infected blood donations and help in reducing HBV transmission with its potential consequences.

Introduction:

Transmission of hepatitis B virus (HBV) infection through donated blood is a common occurrence. In blood bank, screening for HBsAg is carried out routinely to detect HBV infection. Despite testing for HBsAg in blood donors, transfusion-associated HBV infection continues to be a major problem in Bangladesh.

Several reasons may account for the inability to entirely

eliminate that risk.¹ HBsAg tests may be negative in the window phase of acute HBV infection, as well as in chronic HBV infections with very low levels of HBsAg. In addition, mutant forms of HBV due to either single or multiple mutations of the "a" determinant of HBsAg may escape detection by the currently available HBsAg screening assays, and the safety of blood supply can then be affected.^{2,3}

Detection of potentially infectious HBVDNA in the liver, serum or both, in individuals without detectable HBsAg in circulation has been termed occult HBV infection.⁴ High frequencies of HBVDNA positivity have been described among antiHBc positive individuals, when antiHBc is the only seromarker for HBV infection, in the absence of antiHBs or HBsAg.^{5,6}

Antibodies to hepatitis B core (HBc) antigen are marker of acute, chronic, or resolved HBV infection and remain detectable for life. These can be present in the absence of both HBsAg and anti-HBs antibodies. Anti-HBc is therefore detected in anyone who has been infected with hepatitis B virus.¹

It has been demonstrated that some HbsAg negative individuals and those positive for anti-HBc continue to replicate hepatitis B virus (HBV).^{7,8} These findings suggest that recovery from acute hepatitis B virus infection may not result in complete virus elimination, but rather the immune system keeps the virus at a very low level. A positive correlation has been shown between anti-HBc titre and detection of HBV-DNA in serum samples of HBsAg negative individual.⁹

In this study, we wanted to find out the rate of HBVDNA detection in HBsAg-ve, antiHBc positive donations. Since Anti-HBc detection can completely eliminate the risk of HBV transmission and it is not done in all the center of Bangladesh, we proposed whether Anti-HBc(total) could be adopted as a screening assay for the donated blood.

Materials and Methods:

This observational study was carried out in the department of Gastroenterology, Bangabandhu Sheikh Mujib medical university, Dhaka and period of study was from July 2010 to July 2012.

A total of 52 patients (41 male, 11 female, mean age 30±9.3) positive for AntiHBc(total), but negative for HBsAg (whose blood is rejected for transfusion in blood bank) came to our department for evaluation. All the patients were tested for AntiHBs antibody and HBVDNA(PCR).

Results:

Overall, 18 patients (9.36%) out of 52 were found positive for AntiHBs antibody (Table 1). Among the 18 patients with positive AntiHBs antibody, 12 patients had antibody

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titre >10mlU/ml and 6 patients had antibody titre <10mlU/ml. HBVDNA (PCR) was detected in 16 patients (8.32%) among 52 patients with positive antiHBc (total). Regarding antiHBs antibody, 10 patients with negative for antiHBs antibody (total 34 patients) were found to have positive HBVDNA. Among antiHBs positive patients, 4 with antiHBs antibody titre <10mlU/ml and 2 with titre >10mlU/ml, who are supposedly protected against HBV infection, had detectable HBVDNA (Table 2).

Most of the patients had HBV viral load <10⁴ copies/ml.

Table: 1 Demographic, serological and virological characteristics of the patients:

Age (year)	30±9.3	
Male/female	41/11	
AntiHBs	Positive	Negative
	18 (9.36%)	34
	Titre <10mlU/ml = 6	
	Titre >10mlU/ml = 12	
HBVDNA	16 (8.32%)	36

Table 2: HBVDNA positivity according to antiHBs antibody.

	AntiHBs positive	
	Titre >10mlU/ml	Titre <10mlU/ml
HBVDNA	2/12	4/6

Discussion:

In Bangladesh screening for HBsAg is at present the only diagnostic test for detection of HBV infection in blood donations. Several reports around the world showed detection of HBV DNA in blood of HBsAg-negative individuals and suggested transmission of HBV infection by blood transfusion from HBsAg negative occult HBV carriers. The frequency of occult HBV infection varied considerably from different parts of the world according to the prevalence of HBV in the population. Prevalence of occult hepatitis B virus infection is high in high HBV prevalence zone of the world and low in low HBV prevalence zone of the world. Studies from different parts of India reported occult HBV infection ranging from 21% in Kolkata (Eastern India), 20.87% in New Delhi (Northern India) to 0% in Chandigarh (Northwestern India).^{10,11,12} A study from Japan¹³ reported DNA positivity of 38% in 19 of 50 anti-HBc reactive samples. While that from North America found 3.7%, HBV DNA positive among 107 anti-HBc positive/anti-HBs negative samples.¹⁴

Prevalence of occult HBV infection was also high among antiHBc positive patients from the present study, 8.32% of antiHBc positive donations being HBV DNA positive. Furthermore, among the 52 antiHBc positive donations, 18 were antiHBs positive and are supposedly protected against

HBV infection. Notably, 6/18 (33.33%) of antiHBs positive donations were HBV DNA positive, even one of them was with viral load? 10⁴ copies/ml. The higher proportion of occult HBV infection found among the younger group.

Expansion of blood donor screening and improved laboratory detection of viral markers have reduced the risk for infection with transfusion transmitted Viruses.¹⁵ Routine blood donor screening for antiHBc has been implemented in some countries resulting in a decrease in the risk of post-transfusion HBV infection.¹⁴ Therefore, inclusion of antiHBc testing for donor screening will definitely remove possible HBV infected donations.

In conclusion, Anti-HBc (total) should be tested routinely on blood donor volunteers and if the found positive regardless of anti-HBs titre, the blood should be discarded.

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