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RESEARCH ARTICLE

Prevalence of Hepatitis B Surface Antigen and Anti-hepatitis B Core Antibodies among Blood Donors in Diyala-Iraq

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Abstract

Background: In Diyala province and since 2014, the anti-hepatitis B core antibodies (Anti-HBc Abs) was introduced beside the hepatitis B surface antigen (HBsAg) as seromarkers for blood donation screening to reduce the residual risk of occult hepatitis B infection (OHBI). Objectives: this is a lookback study to explore the efficiency of HBc Abs versus HBsAg seromarkers in reducing the residual risk of OHBI through blood transfusion in Diyala province. Materials and methods: This follow-up study starting in January 2016 to August 2017. The results of HBsAg and anti-HBc Abs as blood units screening seromarkers were followed and abstracted from the records of the Central Blood Bank in Diyala Directory of Health. Simple statistical analysis was done using SPSS Version 18 and P value was considered significant wherever it is below 0.05. Results: The results found that the total number of blood units donated during the follow-up period was 47258. The total HBV positive was 2423 (5.12%), of which 213 (0.45%) were HBsAg positive and 2210 (4.67%) were anti-HBc total antibody positive. Totally, 2369 (5.012%) blood donors were positive for both markers. All the 213 blood donors who were positive for HBsAg recorded throughout the two years were male (100%). Whereas 2145 (99.48%) and 11 (0.51%) blood donors positive for anti-HBc Ab were male and female respectively. Cumulatively, 2358 (99.53%) males and 11 (0.46 %) female were positive for both HBV markers. Conclusion: The introduction of anti-HBc Ab along with HBs Ag for screening of blood units is remarkably increase the number of blood units with positive HBV infection and consequently improve the blood safety.

Keywords: *HBsAg, Anti-HBc Ab, Blood safety, Diyala.*

Introduction

Hepatitis B virus (HBV) still represents a global risk factor in transfusion medicine. The residual risk of HBV is arises either through the pre-seroconversion window period or donors with occult HBV infection (OHBI) [1, 2]. Occult hepatitis B virus status is simply defined as the presence of HBV DNA in the liver (with or without detectable HBV DNA in the serum), in the absence of serum HBsAg.

The presence of anti-HBc antibody in serum is an important key for OHBI tracking, although about 20% of OHB cases are negative for anti-HBc antibody [3].The importance of OHBI is mostly related to its possible role in spreading through blood transfusion and liver transplantation, and the persistence of OHBI may progress to cirrhosis and hepatocellular carcinoma [4, 5]. The prevalence of OBI in blood donors was estimated to be 8.55 per 1 million donations and the clinical outcome of occult HBV transmission primarily depends on recipient immune status and the number of HBV DNA copies present in the blood products [5].

Nevertheless, the residual risk of HBV transmission in blood recipients from donors with OHB was considerably variable from country to another depending on the screening strategy and method of estimation

[2, 6, 7]. Mechanisms underlying the OHBI are falling into different categories: defective host immune response, viral replication activity through mutations of HBV DNA sequence or through multiple mechanisms, some of these mutations like S-escape mutants could not be detected by the routine available assays, making them difficult to diagnosis [8, 10]. Worldwide, the blood banks had maintaining high level of attention for OBI carrier identification through implementing effective screening procedures which were generally based on a combination of both serological markers and nucleic acid amplification tests [11, 12]. With a slight inconsistency; however, there is a general consensus that HBV nucleic acid techniques in conjunction with anti-HBc Ab screening has reduced the residual risk of transfusion-transmitted HBV infection and increase recipients safety [13, 16].

In a previous study from Basrah , South Iraq, found that around 2% of blood donors had anti-HBc as the only serological evidence of HBV infection [17]. Certainly each country adopted its own blood screening policy according to local HBV prevalence, outcomes of infectious units per different screening methods and cost-effectiveness. In Diyala province, the anti-HBc total antibodies was introduced along with pre-implemented HBsAg since 2014 to reduce the risk of transfusion- transmitted HBV due to the existing high rate of occult HBI [18]. Therefore, this is a lookback study to figure out the benefits of anti-HBc Ab in achieving blood donation safety.

Materials and Methods

This follow-up study starting in January 2016 to August 2017.The results of HBsAg and anti-HBc Abs as blood units screening seromarkers were followed and abstracted from the records of the Central Blood Bank in Diyala Directory of Health. Simple statistical analysis was done using SPSS Version 18 and P value was considered significant wherever it is below 0.05.

Results

The results found that the total number of blood donated units during the follow-up period was 47258. The total HBV positive was 2423 (5.12%), of which 213 (0.45%) were HBsAg positive and 2210 (4.67%) were anti-HBc total Ab positive, Table (1).

Table 1: HBV seromarkers positivity rate among blood donating units

Years	No. tested	HBsAg + (%)	Anti-HBc Ab + (%)	Both markers + (%)
2016	28341	127 (0.448)	1028 (3.627)	1155 (4.075)
2017	18917	86 (0.454)	1128 (5.962)	1214 (6.417)
Total	47258	213 (0.450)	2156 (4.562)	2369 (5.012)

The 213 blood donors who were positive for HBsAg during the 2016 and 2017, all were males and no female was recorded positive for HBsAg. On the other hand, 2145 blood donors were positive for anti-HBC Ab versus 11 female were positive for the same marker during the two years. Cumulatively, 2358 (99.53%) males and 11 (0.46 %) were positive for both HBV markers.

Table 2: Distribution of HBs Ag and anti-HBC Ab positivity rate by gender

Year	HBsAg +		Anti-HBc Ab +		Both Markers +	
	Male (%)	Female	Male (%)	Female (%)	Male (%)	Female (%)
2016	127 (59.6)	0	1021 (47.6)	7 (63.6)	1148(48.7)	7 (63.6)
2017	86 (40.4)	0	1124 (52.4)	4 (36.4)	1210(51.3)	4 (36.4)
Total	213 (100)	0	2145 (100)	11 (100)	2358 (100)	11 (100)

Discussion

This short term follow-up study was designed to evaluate the performance of anti-HBc total antibodies seromarker in detecting HBsAg negative blood units. In Diyala province, the anti-HBc Ab was introduced a long with the pre-existing HBsAg as a blood donor screening test in 2014. This step was adopted depending on the recommendation of a large HBV surveillance study carried out during 2013-2014, which included large numbers of general population all over the province and reported that the HBsAg positivity rate was 0.65% while the HBc total Ab positivity rate was 9.65% [18].Therefore, the present study is a actually lookback assessment of anti-HBc total Ab in screening of blood units after 2 years of implementation. Comparing with Al-Tai and co-workers results, the present HBsAg positivity rate is nearby (0.45% *Vs* 0.65%). The slightly lower positivity rate in the present study may be related to the fact that in the former survey study, the

participants were selected randomly from the general population over a wide age range of both sexes, while in this study blood donors were all adult and mostly males.

Besides that, according to the blood bank legislation, all blood donors should be clinically checked out and preliminary hematological investigations were done and routinely non-eligible donors were excluded. Regarding the anti-HBc total Ab, the current study found that 5.01% of blood donors were positive compared to 9.65% reported by Al-Taie and co-workers study in 2014 [18].Generally, the two studies are totally agree that the anti-HBc Ab test increased the detection rate of HBV positive whether in the community or among blood unites. Aiming to minimize the transfusion transmission risk of HBV, the current study and others are concordant that the addition of anti-HBc Ab (IgM or total) test for screening policy of blood units gives a marvelous results [1, 16, 17, 19].

The value of anti-HBc Ab test for blood unites screening is arising through detection of low-level HBV DNA-positive as well as those with negative HBs Ag donors or occult HBV infection and that the use of HBsAg screening alone showed minimal blood safety. Actually, this concept has gained a universal consent earlier in this century [1, 13, 14, 20]. Of note, occult HBV infection, is a challenging clinical entity recognized by two main characteristics; absence of HBsAg, and low viral DNA replication. A remarkable progress in the understanding of OBI has found characteristic molecular mutations in the preS/S regions [4, 8, 9, 10]. The clinical outcome of occult HBV transmission primarily depends on recipient immune status and the number of HBV DNA copies present in the blood products. Furthermore, the presence of donor anti-HBs antibodies reduces the risk of HBV infection by approximately five-fold. The risk of HBV transmission may be lower in endemic areas than in non-endemic areas, because most recipients have already been exposed to HBV [5, 7]. Another fascinating result was the presence of a relatively high rate of occult HBV infection among blood donors (4.67%). In a previous study among HBsAg negative donors, the anti-HBc IgM, and HBV-DNA positivity rate were 3.4%, and 3.9% respectively, incriminated occult HBV infection contributed, at least in part, for the perpetuation of HBV infection in our community [21].

Consequently, our results in this regard are in agreement with comparable studies conducted worldwide affirming the value of maintaining anti-HBc Ab for the detection of low-level HBV DNA-positive donors [1, 5, 6, 14]. Thus after 3 years of implementing the anti-HBc Abs test in the screening of blood units, we are now fully assured that it was a right decision. Actually, these successes encourage us to release a new recommendation that is the necessity to add a molecular method for detection of HBV DNA to maximize the blood safety. Undoubtedly, these sensitive molecular techniques were approved its efficacy in reducing the residual risk of transfusion-transmitted HBV infection [11, 12, 22, 23].

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