Anti HBc in Blood Donors Who Pass the Filter Test of Spread Infections through Transfusion

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Keywords: Blood transfusion, Screening, HBV, HBsAg, Anti-HBc.

Abstract: Blood transfusion is a medical procedure that helps cure patients and even saves lives, but is at risk of transmitting infectious diseases through transfusions. Transfused blood donors should be safe and free from the risk of disease of Hepatitis B, HIV, Spilis and Hepatitis C by the chemiluminescence immunoassay method. Description of anti-HBc in blood donors who passed the screening test of spread infections through blood transfusion (SIBT) and the relationship of the HBsAg to the anti-HBc indexs were evaluated by cross sectional method with sample of 123 respondents. The SIBT screening test results on anti-HBc show about 18.7% and 81.3% of respondents were failed and passed, respectively. Other test results showed the frequency of anti-Hbc in blood donors with negative HBsAg of 13 respondents (13%) was declared reactive, with a history of never having participated in hepatitis immunization before.

1 INTRODUCTION

Since 1985, efforts to safeguard the blood safety of donors against hepatitis B virus (HBV) infection have been tested for each bag against Hepatitis B Surface Antigen (HBsAg) (Suryani, and Setiawaty, 2015). Hepatitis B is inflammation of the liver caused by the HBV virus. This virus belongs to the family Hepadnaviridoe (Ferdianto, 2019). The hepatitis B virus is a prototype member of the Hepadnaviridae (hepatotropic DNA Virus) family. The Hepadna virus has a strong preference for infecting liver cells (Don Ganem and Alfred, 2006). But a small portion of hepatitis DNA can also be found in the kidneys, pancreas, and monoclear cells. Transmission of HBV is the same as transmission of human immunodeficiency virus (HIV) through contact with blood or body fluids from people infected with HBV. Besides HBV transmission can also be through blood transfusions that are contaminated with HBV and who often get hemodialysis (Amtarina, 2009).

Occult HBV infection is defined as the presence of HBV DNA in blood or liver tissue in patients negative for HBsAg but may or may not be positive for HBV antibodies. It is possible that, donors with occult HBV infection (which is detected to be HBsAg deficient) have exposure to HBV infection as shown by positive anti-HBc positive. Antibodies against HBV nucleus antigens and HBV DNA, are also a potential source of HBV infection (Asim, 2010).

Disguised HBV has been proposed since the 1980s, but has only been well identified during the past 10 years after the discovery of molecular biology techniques (Karjadi, 2015). Through observation with electron microscopy in the serum of patients infected with HBV can be found several types of HBV particles. Persistence of the hepatitis B virus genome (HBV DNA) in individuals with negative HBsAg (hepatitis B surface antigen) is referred to as disguised HBV infection. The possibility of occult HBV is often found in patients with immunosuppressed conditions induced by therapy or diseases related to the immune system. Disguised hepatitis B infection appears to be more related to strong suppression of viral replication and gene expression. Intact HBV virions are called Dane particles. Dane particles of 40-42 nm with double shelled usually contain surface antigens. In the middle there is a nucleocapsid surrounded by a protein sheath and consists of hepatitis B core antigen (HbcAG), Hepatitis Be antigen (HbeAG), HBV genome, and DNA polymerase (Amtarina, 2009). Hepatitis B vaccination was given as an effort to protect against hepatitis B infection, which can be given at any age level from infants to adults. The success of a vaccination can be determined based on

Novia, ., Ginting, C., Chiuman, L. and Ginting, S.
Anti HBc in Blood Donors Who Pass the Filter Test of Spread Infections through Transfusion.
DOI: 10.5220/0010286400300034
In *Proceedings of the International Conference on Health Informatics, Medical, Biological Engineering, and Pharmaceutical (HIMBEP 2020)*, pages 30-34
ISBN: 978-989-758-500-5

the measurement of anti-body titers formed through laboratory tests (Astuti and Kusumawati, 2013).

Several researchers have conducted research related to examine issue, including Anti HBc screening in Indian Blood Donors still an unresolved issue that carried out by the Transfusion Medicine Department in collaboration with the PGIMER Hepatology Department, Chandigardh. Observations were made for 1 year from July 2005 to December 2006 with a total sample of 1700 donors using two methods, namely PCR and ELISA. The results showed that the incidence of HBV DNA was low in anti-HBc reactive samples due to the limited sensitivity of HBV DNA amplification techniques. Another possible reason is the low sensitivity of HBV DNA due to the type of blood donor and disease endemicity in the study population (Dhawan, 2008). Anti Hb Core screening significance of healthy blood donors in Fayoum with a total sample of 400 blood donors using a prospective cross-sectional cohort analysis with analysis methods using PCR and ELISA (Abdelaziz, 2016; Turnip et al, 2020; Wijaya et al, 2019). Positive Anti HBc description was also found in blood donors with negative HbAG with a sample of 100 respondent using a cross-sectional descriptive analysis and the ELISA methods (Susila, 2015).

Anti-HBc blood donor screening still varies in different countries, where HBV prevalence is still low (generally <2%), while it is not carried out in areas with high HBV since the impact of anticipating anti-HBc donors is considered unsustainable. However, the prevalence of hidden HBV infection is higher in areas that commonly with HBV infection. Therefore, in some areas low antibody titers of HBC or high titers against HBsAg (antiHBs) are used to minimize the risk of transmission (Manzini, 2007). Furthermore, it is necessary to conduct a study that examines the extent of blood transfussion that is considered HBV-free (HBsAg) which is still possible to transmit HBV through additional anti-HBc examination. This is not only necessary to increase the academics knowledge, but is also needed as material for health service policy especially to address the problem of HBV transmission. Different from previous studies, researchers used the chemiluminescence immunoassay (CLIA) analysis method in examining blood samples.

2 METHOD

The study was conducted at the Indonesian Red Cross Blood Transfusion Unit, Batam-Riau Islands from 01 to 31 December 2019. Donors who met the general criteria for the Blood Transfusion Unit were used in the study. Respondent data used have passed the scrining of spread infections through blood transfusion (SIBT) with CLIA Architect.i.2000 Sr. method. Architect.i.2000 Sr method is used to detect qualitative antibodies against Hepatitis B core antigens (anti-HbC) in human serum and plasma. The CLIA method is a type of biochemical immunoassay test that measures the concentration of a substance in a liquid, in the form of blood serum or urine by observe antibody reactions to its antigen. Serum or plasma was used as HBsAg examination material. The CLIA method can also used to study HIV, HCV, HBSAG, and Siphilis in the blood of donors. The CLIA works using derivatives of luminol with peroxidase and H2O2 (or other enzymatic systems that produce H2O2, such as glucose oxidase or uricase) with enhancers (derivatives of phenols, such as p-iodophenol) that can increase light emission up to 2,800 times.

To observe the anti-Hbc description of donors who have passed the SIBT examination, a cross-sectional design of the independent and dependent variables is used. The sample size was 123 respondents (five milliliters of blood per respondent) with inclusion and exclusion criteria. Inclusion criteria included being willing to become a respondent by signing an informed consent, voluntary and routine donors coming to the UTD PMI Batam city, patients who met the blood donor criteria and patients who passed the SIBT screening. While the exclusion criteria were not passing the SIBT screening, the voluntary donor first donated blood, and was not willing to participate in the study.

Before doing this research, I gave a questionnaire to potential donors who wanted to participate in this research by filling out a questionnaire. The questionnaire must be filled in by answering the questions I gave. As :Have had hepatitis immunization before ,Have a history of contact with people with hepatitis B,Has previously been declared cured of hepatitis B.

Summary of the respondents characteristics included are the age of 18-24 years about 17 men and 6 women, aged 25-44 years about 5 men and 8 women, aged 45-65 years about 82 men and 5 women. History of blood donors with a frequency of donors 20 -39 times about 25, 40-60 times about 83 donors, 61-80 times about 10 donors, and 81-100 times about 5. History with and without immunization about 87 and 13, respectively. Respondents with a family history who had a risk of hepatitis were 100 and no family members were indicated. The summary diagram of the research

process is shown in Figure 1. Figure 1 where the donor after filling out the questionnaire and doing a blood pressure check and blood tapping. And then samples were taken for screening IMLTD 4 parameters. Then the sample is rotated in a centrifuge at a speed of 4000 rpm and then the blood sample is examined and put into a CLIA instrument. After the results of the initial screening came out and were declared non-reactive, the blood sample was raised back to further tests, namely the anti-Hbc test.

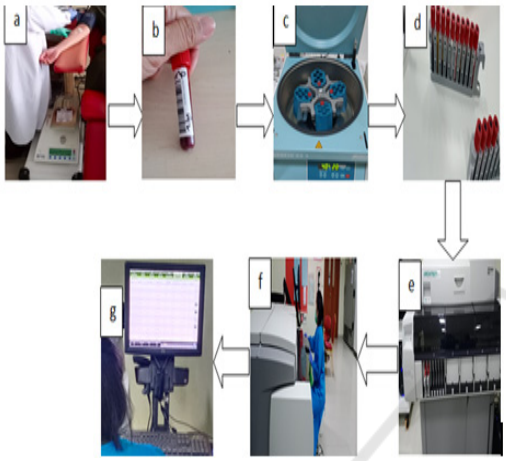

Figure 1. Blood sample processing: (a) Donors who pass the screening test of SIBT, (b) Blood sample, (c) Centrifius process, (d) After centrifius, (e) Insert into CLIA system, (f) Sample analysis, (g) Data recording.

3 RESULTS AND DISCUSSION

Based on the screening test results of the SIBT, it was obtained that the pass donors were 100 respondents as shown in the Table 1. The screening test on SIBT aims to determine which blood can be transfused with the lowest possible transmission. The screening test consists of several stages including HBsAg screening test in the form of a blood test to find out whether someone is infected with the hepatitis B virus or not. Venereal Disease Research Laboratory (VDRL) screening test to find out whether someone is infected with Treponema pallidum bacteria that causes syphilis. HIV screening test (infectious disease that causes Acquired Immunodeficiency Syndrome (AIDS)) is a screening procedure to detect HIV infection in the patient's body. Hepatitis C screening test (HCV) is an infection that attacks the liver. Hepatitis C often does not provide symptoms, but chronic infection can cause scarring (eskar) in the liver, and after chronic causes cirrhosis. If the index value <1 defined as normal and if the index value> 1 is included reactive.

Table 1: Screening Test of the SIBT.

Screening Test	Not Pass	Pass
HbsAg	6	
VDRL	12	
HIV	1	
HCV	4	
Total	23	100

Based on the study results, majority of donors have the results of anti-HBc examination that non reactive and reactive are 87 (87%) and 13 (13%), respectively (Table 2). Infection by the virus of hepatitis B is a public health problem and is the main cause of morbidity and mortality especially in developing countries. The world can be divided into three regions based on the prevalence of HBV infection, namely chronic: high (> 8%), medium (2-8%), and low (<2%). Most countries in the world are still considered moderate to high endemicity for HBV infection. In Batam the prevalence of hepatitis B varies from 2.3 to 2.5%, depending on various regions of the country. Blood transfusions collected from blood donors in the window period can cause post transfusion of hepatitis B in recipients. At present, HBsAg detection is the only diagnostic screening test for HBV infection in Indonesia.

Table 2: Indeks Anti Hbc (R is respondens and r is reactive)

R	r	R	r	R	r	R	r
R1	0,13	R26	0,09	R51	0,13	R76	3,77
R2	0,10	R27	0,15	R52	0,88	R77	0,13
R3	0,07	R28	2,59	R53	0,12	R78	0,07
R4	0,14	R29	0,06	R54	0,08	R79	0,18
R5	0,30	R30	0,13	R55	0,07	R80	3,22
R6	0,13	R31	0,08	R56	0,07	R81	0,12
R7	0,17	R32	0,10	R57	0,10	R82	0,08
R8	0,08	R33	0,18	R58	0,12	R83	0,08
R9	0,07	R34	0,50	R59	3,22	R84	0,12
R10	0,10	R35	0,45	R60	0,12	R85	0,14
R11	1,90	R36	0,12	R61	0,07	R86	0,06
R12	0,07	R37	0,09	R62	2,77	R87	0,12
R13	0,12	R38	0,40	R63	0,10	R88	3,02
R14	0,10	R39	0,13	R64	0,09	R89	0,13
R15	0,09	R40	3,77	R65	0,16	R90	0,07
R16	0,16	R41	0,07	R66	0,08	R91	0,08
R17	0,12	R42	0,06	R67	0,18	R92	0,16
R18	3,78	R43	0,13	R68	0,17	R93	0,10
R19	0,15	R44	0,02	R69	4,02	R94	0,12
R20	0,08	R45	0,07	R70	0,10	R95	0,07
R21	2,59	R46	0,12	R71	0,07	R96	3,22
R22	0,14	R47	0,09	R72	0,15	R97	0,12
R23	0,10	R48	3,78	R73	0,16	R98	0,13
R24	0,12	R49	0,15	R74	0,18	R99	0,08
R25	0,07	R50	0,08	R75	0,07	R100	0,20

Respondents who passed the SIb HBsAg screening test with the CLIA method did not necessarily not transmit the HBV virus, because from the results of the study, 100% of respondents were declared to have passed the HBTAg SIBT screening test but in the Anti HbC test there were 13 respondents (13%) who had the test results reactive. This certainly will greatly affect the transmission of the hepatitis virus through blood transfusions. Anti-HBc has been found as an excellent indicator for hidden HBV infection during the window period. Another indication for detecting HBV infection hidden in HbsAg negative blood donors is the detection of HBV DNA by a polymerase chain reaction (PCR), but it is not cost-effective. Anti-HBc detection has contributed significantly to the reduction in the incidence of post-transfusion hepatitis B in patients. The anti-HBc IgM class is an indicator that shows recent infections. Variations in anti-HBc IgG appear later during infection and point to past HBV infection. Individuals with various anti-HBc IgG may not transmit because they may have antibody titers that are high enough for protective HBsAg (anti-HBs), and affected people may actually be free of anti-HBc disease produced in plasma shortly after HBsAg and remain in circulation for 3-4 months. Anti-HBc can be detected using the CLIA method, but the very sensitive CLIA method cannot detect the presence of viral DNA from hepatitis.

4 CONCLUSIONS

Donors who have passed the hepatitis B SIBT screening test may not be safe from spread of the Hepatitis B virus and Indonesian Red Cross has no core examination of the hepatitis B virus. This means that blood discharge of the Indonesian Red Crossis not necessarily safe for transfusion. This is supported by the results of the study, 123 total donors who passed the screening of hepatitis B found that 100 respondents still have the core of the hepatitis B virus that can transmit to patients who receive blood.

REFERENCES

Abdelaziz, H.S dkk., 2016. Anti-HB Core Screening Significance Healthy Blood Donors in Fayoum,Egypt. J Infect Dis Preve Med. 4:2

Alavian SM dkk. 2008. Hepatitis B virus infectionin Iran: a systematic review. Hepat Mon. 8: 281–294.

Amtarina.R,dkk.2009.Faktor Risiko Hepatits B pada Tenaga Kesehatan Kota Pekanbaru.Jurnal Fakultas Kedokteran Unpad.41:3

Asim.m,dkk.2010.Significance of anti-HBc Screening of Blood Donors & its association wuth Occult Hepatitis B Virus Infection: Implication for Blood Tranfusion.Indian J Med Res.132:312-317

Astuti,H.P dan Kusumawati,E. 2013. Kajian Efektivitas Pemberian Vaksinasi Hepatitis B terhadap Pembentukan Anti Bodi Anti HBs. Jurnal D-III Kebidanan Stikes Kusuma Husada;Surakarta

Dhawan,H.K,dkk.2008. Anti-HBc screening in indian blood donors still an unresolved issue. World J Gastroenterol. 14;14(34):5327-5330

Don Ganem. M. D., Alfred. M. P., 2006. Hepatitis B Virus Infection-Natural History and Clinical Consequences.the new england journal of medicine.350:1118-29.

Ferdianto., 2019. Hepatitis B.Di Kutip 15 Oktober 2019. dari artikel:https://prodiaohi.co.id/hepatitis-b.

Franco E dkk. 2012. Hepatitis B: Epidemiology andprevention in developing countries. World J Hepatol. 27: 74–80.

Handayani,W dan Haribowo,A.S. 2008. Buku Ajar Asuhan Keperawatan pada Klien dengan Gangguan Sistem Hematologi. Jakarta : Salemba Medika

Hennig dkk.2002. Frequency and load of hepatitis Bvirus DNA in first-time blood donors with antibodies to hepatitis B core antigen. Blood. 100: 263741.

Karjadi,T.G dkk.2015.Proporsi Infeksi Virus Hepatitis B Tersamar pada Pasien yang Terinfeksi Human Immunodeficiency Virus.Jurnal Penyakit Dalam Indonesia.2:3

Kementrian Kesehatan Republik Indonesia (Kemenkes).2015. Pedoman Pelayanan Laboratorium Pemeriksaan Hepatitis

Khuns, M.C., Busch.M.P, 2006. New Strategies For Blood Donor Screening For Hepatitis B Virus. Mol Diag Ther. 10(2):77-91

Kumar.C.H, dkk.2006. The Role Of anti-HBc IgM in Screening Of Blood Donors. Med J Armed Forces India. 63(4) : 350-352.

Manzini,P.,dkk. 2007. Italian blood donors with anti-HBc and occult hepatitis B virus infection. 92:1664-1670. DOI:10.3324/haematol.11224

Muhlbacher dkk.2001. Is infective blood donation missed out without screeningfor antibody to hepatitis B core antigen and/or hepatitis B virus DNA. Vox Sang. 81: 139.

Mulyantari,N.K dan Yasa,I.W.P.S. 2016. Laboratorium Pratranfusi Up Data. Denpasar : Udayana University Press Kampus Universitas Udayana Denpasar

Murniasih,Arif. 2018. Skripsi Perbedaan Kadar HbsAg Sampel Serum dan Plasma Metode CLIA Pada Pendonor. Semarang : Universitas Muhammadiyah Semarang

Ott JJ, Stevens GA, Groeger J, Wiersma ST. 2012. Global epidemiology of hepatitis B virus infection: newestimates of age-specific HBsAg seroprevalence and endemicity. Vaccine. 9: 2212– 2219.

Peraturan Menteri Kesehatan Republik Indonesia Nomor 91 Tahun 2015 tentang Standar Pelayanan Tranfusi Darah

Rachman,F.S dan Aditya,R.N. 2013. Questions & Answers Donor Darah. Jakarta : PT Elex Media Komputindo

Suryani, U., Setiawaty, V., 2015. Metode Nucleic Test untuk uji saring virus Hepatitis B pada Darah Donor dengan Hepatitis B Occult.Jurnal Biotek Medisiana Indonesia.4.2.2015:51-58.

Susila,S. 2015. Gambaran Anti HBc Positif Pada Donor Darah Dengan HbsAG Negatif. Majalah Kedokteran Andalas. Vol 33 No 2.

Turnip, A., Andrian, Turnip, M., Dharma, A., Paninsari, D., Nababan, T., Ginting, C.N., 2020. *An application of modified filter algorithm fetal electrocardiogram signals with various subjects*, International Journal of Artificial Intelligence, vol. 18, no., 2020.

Wijaya, C., Andrian, M., Harahap, M., Turnip, A., 2019. *Abnormalities State Detection from P-Wave, QRS Complex, and T-Wave in Noisy ECG*, Journal of Physics: Conference Series, Volume 1230, (2019) 012015. doi:10.1088/1742-6596/1230/1/012015.