

Prevalence of Hepatitis B Virus and Hepatitis C Virus in Blood Transfusion in Tertiary Care Hospital of North India

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Abstract:

Aims: Blood transfusion saves life but there is risk of Transfusion Transmission Infection (TTI), like Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Human Immunodeficiency Virus (HIV), malaria and syphilis. Aim of this study to find prevalence of HBV and HCV in blood centre.

Settings and Design: This is an observational study at Blood centre of Tertiary care hospital from January 2018 to December 2020.

Methods and Material: Donor Screened and selected according to National Aids Control Organisation (NACO), blood units were collected and processed. HBV and HCV reactive cases were diagnosed by enzyme-linked immunoassay (ELISA) analyser. HBV and HCV reactive donors further processed for Liver Function Test (LFT), Prothrombin Time (PT) and Complete Blood Count (CBC) were done.

Statistical analysis used: Performed with SPSS software version 15. Chi-square proportion test has been used to compare the proportions of HBV seropositive between voluntary blood donor collection (VBD) and replacement blood donor (RBD) groups.

Results: Blood units collected were 9,750, numbers of VBD was 5,305 and RBD was 4425, during the study periods of three years in the blood centre, HBV and HCV reactive cases were diagnosed 50 and 02 respectively, and 35 HBV reactive in RBD. The p value of chi square test for testing two group (proportions of HBV infection between VBD and RBD group) proportions at 95% confidence interval is 0.0017.

Conclusions: TTI can be prevented by promoting the voluntary donors, educate donors for TTI during donor screening, evaluate the methods of TTI screening.

Key-words: Blood, Transfusion, Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Enzyme Linked Immunosorbent Assay (ELISA), Liver Function Test (LFT).

Introduction:

Blood transfusion plays an important role in saving a life, but there is the benefit and risks of receiving a blood transfusion, predominant risks are accidental transfusion of incorrect blood unit and transfusion transmissible infection¹. The incidence of risks decreases by improving

the quality system of the blood bank, blood should be given only when needed, increase voluntary blood donors, safe blood collection, processing, and storage, transport at maintained temperature. There is a screening of donor blood for Transfusion Transmissible Infections (TTI), before blood donation by single rapid immunoassay (rapid card test) or by enzyme-linked immunosorbent assay (ELISA)². TTI which are screened during pre-donation blood transfusion are hepatitis B virus (HBV), hepatitis C virus (HCV), Human immune deficiency virus (HIV), syphilis, and malaria, but due to the promotion of voluntary non-remunerated donors for blood donation, it reduces the risk of TTI. HBV and HCV are substantial major world health problems because they can cause chronic disease, which shows their latent nature (not presenting clinical features). Globally, approximately 240 to 340 million people have been infected worldwide with hepatitis B Virus (HBV) well more than 170 million people showing chronic hepatitis C virus^{3,4}. India has approximately 10-15% of the HBV carrier of the world and 0.5-1.5% of the HCV carrier of the world, respectively^{5,6}. HBV contains double-stranded DNA belonging to the Hepadnaviridae family of the virus, HCV contains a single-stranded RNA virus belonging to the Flaviviridae family of viruses. HBV and HCV affect the liver causing liver cirrhosis which further increases the risk of liver cancer such as hepatocellular carcinoma. Both viruses HBV and HCV are transmitted by blood and body fluid (particularly semen and vaginal secretion).

It can be transmitted to a child during their delivery, but breastfeeding doesn't increase any risk of transmission of infection. In few cases, there is transmission by injecting drugs or by accidentally needle prick or by exposure to sharp instruments. HBV can survive outside the body for a prolonged time. HBV and HCV affect the liver, so liver function tests including Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST), Gamma Glutamyl transferase (GGT), Alkaline Phosphatase (ALP), Bilirubin, Prothrombin Time (PT) can be used to monitor the progression of infection predominantly by measuring the Alanine Aminotransferase (ALT) and Aspartate Aminotransferase (AST) in the blood test. There is the prevention of hepatitis B infection by providing safe and effective vaccination, but no such prevention method is known for HCV.

Subjects and Methods: This is a retrospective descriptive observational study, source of information obtained from the TTI registers of blood center of Autonomous state medical college from January 2018 to December 2020. Donor screening according to standard operating procedure (SOP) of blood center (where donor age 18 - 65 years, weight > 50 kg, hemoglobin > 12.5gm/dl, free from diseases) were done, donors were selected. Blood was collected in their respective blood bags within ten minutes of the procedure under observation by a medical officer. Blood samples from donors were also collected in ethylenediamine Tetra-acetic Acid (EDTA) and plain vial. Further donors were taken to rest in the refreshment room and observed by a medical officer for twenty minutes to look for any complications after blood donation, at that time they were offered plenty of liquid juice. On the same day of blood collection, collected blood samples undergo test procedures like blood grouping in serology room, TTI screening in TTI room, where HBV-reactive cases diagnosis done by 3rd generation based enzyme-linked immunoassay (ELISA) analyzer by using Hepalisa and MerilisaHbsAg kit on a sample which was separated from plain vial blood samples by centrifuged it with 2500 revolution per minute (RPM) for five minutes. Similarly, HCV cases

diagnosis is done by ELISA method by using HCV Microlisa and Merilisa HCV kit. To check the quality of tests both positive and negative controls provided in kits were also run simultaneously with each test. Those who were positive either to HBV or to HCV, their samples were further tested in the pathology department by ELISA method for confirmation. HBV and HCV-reactive cases were further called for informing them about HBV and HCV reactivity and processed for a basic investigation like complete blood count (CBC) that contains hemoglobin (Hb), Total leucocyte count (TLC), Differential Leucocyte count (DLC), Platelet Count (PC), by Medonic cell counter based on three-part from using blood in EDTA vial and Liver Function Tests (LFT) such as serum Aspartate Transaminase, Alanine Transaminase, Gamma-glutamyltransferase, serum alkaline phosphatase, serum protein, and serum bilirubin were done by chemiluminescence method (Abott Architect i1000sr) by using serum from the plain vial.

Statistical analysis

Data was collected and entered in excel. Statistical analyses were performed with SPSS software version 15. The numbers of HBV and HCV infections cases were tabulated as counts and percentages. Chi-square proportion test has been used to compare the proportions of HBV seropositive between VBD and RBD groups.

Hypothesis:

Null Hypothesis (H_0): The proportions of HBV infection between VBD group (p_1) and RBD group (p_2) are equal.

Alternative Hypothesis (H_1): The proportions of HBV infections in VBD group (p_1) is less than the proportions of HBV infection in RBD group (p_2).

Results:

The total number of blood units collected were 9,750, (in 2018 blood units 3070, in 2019 blood units 4250, in 2020 total blood units 2430) during the study period of three years in the blood centre, where the number of voluntary blood donor collection (VBD) 5,305 was more than replacement blood donor collection (RBD) 4445. The number of males (9130) was greater than the females (620) in this study. Total number of HBV and HCV reactive cases diagnosed were 50 and 02, respectively, where HBV reactive donors were founded more in replacement blood donors (35 HBV reactive in replacement blood donors) and both cases of HCV reactivity were seen in replacement blood donors. The p-value of chi square test for testing two group (proportions of HBV infection between VBD and RBD group) proportions at 95% confidence interval is 0.003. Hence null hypothesis is rejected and concluded that the proportions of HBV infection in VBD group is significantly less than the proportion of HBV infection in RBD group. Those who were reactive for HBV and HCV were evaluated for liver function tests. ALT was increased in 10 of 50 and AST increased in 05 of 50 HBV-reactive cases, the rest of the LFT parameters (total protein, bilirubin, serum alkaline phosphatase) were within the normal limit. CBC and PT of HBV-reactive donors were in the normal limit. HCV-reactive donors had all parameters of the test within the normal limit.

Discussion :

Blood transfusion saves the life in various conditions, nothing is available till date to replace blood transfusion. Blood is available in limited quantity, blood transfusion has various side-effects besides the benefits, which can be prevented by making transfusion protocols of hospital by transfusion committee, which is made by a multidisciplinary medical staff. According to World Health Organization (WHO) total blood collection of the world is 118.4 million where 7.8 million blood is collected from the voluntary donors in 2018, while in India according to National Aids Control Organization (NACO), total blood collection is 11,645,791 where 71.9% are by voluntary blood donation in 2015⁷. In our study the total number of blood collection is 9750 in period of study from January 2018 to December 2020, where voluntary blood donations (54.61%) are more than the replacement blood donations (45.39%). The increase in voluntary non-remunerated repeat blood donors reduced the chance of TTI. In 1996, Supreme court judgment directed National Blood Transfusion Council (NBTC) the objectives to promote voluntary blood donation, so that we can ensure safe blood transfusion⁸. The total number of blood transfusion by male donors (93.5%) were much higher than the female donors, because donor selection guideline by NBTC, haemoglobin of donors > 12.5 gm/dl, age 18 – 65 years, weight > 45 kg for 350 ml whole blood and > 50 kg for 450 ml of whole blood along with good health. According to the National Family Health Survey (NFHS), more than 50% of women aged 15 – 49 years had iron deficiency anaemia (WHO defined anaemia in women as haemoglobin concentration < 12 gm/dl for non-pregnant women aged 15 years or more)⁹. Blood Transfusion is associated with risk of infections by the blood transfusion, such as HBV, HCV, HIV, syphilis and others. Our major concern is to provide safe, efficient blood supply, which can be increased by increasing the voluntary non-remunerated repeat blood donors, training the staff and monitoring the efficiency of TTI screening procedure. TTI test done by single rapid or quick method, ELISA batch analyser and Nucleic Acid Test (NAT). NAT can detect TTI during their window period but due to its high cost it is unaffordable by various blood centres. In 2002, the National Blood Policy was “*An action plan for blood safety*” to ensure safe blood supply¹⁰. This policy stated that all reactive blood donors should be informed. The total number of HBV reactive during the study period is 50, while total HCV reactive is 02. Incidence of HBV is higher in our studies compared to HCV reactivity. Approximately 15%-40% chronic hepatitis B patient progress to cirrhosis, liver failure, and hepatocellular carcinoma depend on viral genotype, host immune system, associated with any coinfection, or alcoholism¹¹. In comparison to HIV, HBV is 50- 100 times more infective¹². In our study replacement blood donors were more HBV (70%) and HCV (100%) seropositive than voluntary blood donations. HBV can be prevented by effective vaccination, by promoting voluntary, non-remunerated, repeat donor, aware the public about TTI, through the intervention program via social media, mass campaign or via news – paper.

The liver is affected by the virus which in results release of the liver enzyme stored in liver into the blood. So in our study AST was increased in 10%, and ALT was increased in 20% cases of reactive HBV, respectively, but the ratio between the serum levels of aspartate transaminase (AST) and alanine transaminase (ALT) in each donor was less than one. The upper range of AST and ALT in serum in our study was 40 IU/L (International unit

per litre). HCV reactive donors had all parameters of liver function test within normal limit. Few studies have shown that 16% of chronic HCV have histological damage beside having normal aminotransferase levels¹³. All other blood tests such as CBC and PT normal in both HBV and HCV reactive donors.

A limitation of our study is failed to further follow HBV and HCV reactive donors, after there one visit to the blood centre.

Table 1: Donation type and year wise classification of blood collection unit

Serial Number	Years	Total Blood Units	Voluntary Blood Donation (VBD)	Replacement Blood Donation (RBD)
01	2018	3070	1830 (59.6%)	1240(40.4%)
02	2019	4250	2290 (53.9%)	1960(46.1%)
03	2020	2430	1185 (48.8%)	1245 (51.2%)
Total		9750	5,305 (54.4%)	4445 (45.6%)

Table 2: Prevalence of Hepatitis B virus and Hepatitis C virus infection in blood donors:

	HBV reactive donors	HCV reactive Donors
VBD	15(30%)	00(00%)
RBD	35(70%)	02(100%)
Totals	50	02

Table 3: Gender wise classification of donors on the basis of HBV and HCV infections:

	Male (%)		Female (%)		TOTAL	
	VBD	RBD	VBD	RBD	VBD	RBD
HBV Reactive	10 (20%)	24(48%)	05 (10%)	11(22%)	15 (30%)	35(70)
HCV reactive	00 (00%)	00(00%)	00(00%)	02(100%)	00(00%)	02(100%)

Table 4: Chi-square test to compare the proportion of HBV infection:

Donor Group	Total Donors	HBV reactive	Sample proportion	Chi-square value(calculated)	p- value
VBD	5305	15	0.0028	7.26	0.003
RBD	4445	35	0.0067		

Table 5: Status of liver enzyme in HBV and HCV seropositive donors

Liver Enzyme	HBV reactive donors	HCV reactive donors
Alanine Aminotransferase(ALT)> 40 IU/L	10(20%)	00(00%)
Aspartate Aminotransferase(AST)> 40 IU/L	05(10%)	00(00%)

Conclusions:

Transfusion transmissible infection diagnosis play essential role in blood bank, but due to prolonged window periods of virus in blood, there is still a chance of infection transfer. This can be prevented by promoting the voluntary donors, educate donors for TTI during donor screening, evaluate the methods of screening done for TTI.

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Conflict of Interest: There is no conflict of interest.