

# Seroprevalence of HBV, HCV, HIV and syphilis infections among blood donors at Blood Bank of King Hussein Medical Center: A 3 Year Study

Baheieh Al Abaddi  
Maha Al Amr  
Lamees Abasi  
Abeer Saleem  
Nisreen Abu hazeem  
Ahmd Marafi

Princess Iman center for research and laboratory sciences, King Hussein medical center, Jordan

## Correspondence:

Dr. Lamees Abasi, Princess Iman center for research and laboratory sciences, King Hussein medical center, Jordan

**Email:** lameesabasi@yahoo.com

## Abstract

**Objective:** This retrospective study was performed to find out the Seroprevalence of HBV, HCV, HIV and syphilis infections among blood donors at Blood Bank of King Hussein medical center and to establish strict guidelines for blood transfusion to reduce the incidence of TTI, thus ensuring safe blood supply to the recipients.

**Method:** The present study was carried out in Blood Bank of King Hussein Medical Center over 3 years from January 2009 through to December 2011. We determined among voluntary and replacement blood donors at Princess Iman Center for research and laboratory medicine, the seroprevalence of human immunodeficiency virus (HIV), hepatitis C virus (HCV), hepatitis B virus (HBs Ag, HBc Ab) and syphilis. Sera of all donors were tested using commercial kits relying on enzyme linked Immunosorbent assay. Qualitative detection of HBs Ag was carried out using (Bioelisa). Each donor's serum sample was screened for HIV-1 and HIV-2 Ab using Biorad (GenscreenHIV1/2 version2), and HCV Ab screening is carried out using Murex anti HCV version 4 following the

manufacturer's instructions. For in vitro diagnostic use the IMMULITE 2000 systems analyzers for the qualitative detection of total antibodies against hepatitis B core antigen (HBc Ab-total) in human serum was used. Screening for Syphilis was carried out using RPR (Rapid plasma regains) confirmed by TPHA (Treponema pallidum hemagglutination). Tests were performed according to the manufacturer's instructions.

**Results:** A total of 94,270 blood donor records from year 2009 to 2011 at King Hussein Medical Center were apparently healthy adult voluntary and replacement donors. Voluntary donors represent 30% of the total donors while replacement donors represent 70%. Total number of 94,270 blood donors from year 2009 to 2011 at King Hussein Medical Center were screened for HBs Ag, HCV Ab, HIV1/2 Ab, HBc Ab total and RPR at Princess Iman Center for research and laboratory medicine.

In 2009 a total number of 28,315 were screened for TTI and show 245(0.86%) were positive for HBs Ag, 44(0.15%) were positive for HCV Ab, 13 (0.05%) were positive for HIV1/2 Ab, 6(0.02%) were positive for RPR, 1861 (6.57%) were positive for HBc Ab total.

In 2010 a total number of 31,543 were screened for TTI and show 293(0.92%) were positive for HBs Ag, 57(0.18%) were positive for HCV Ab, 4 (0.012%) were positive for HIV1/2 Ab, zero % were positive for RPR, and 2,305 (7.3%) were positive for HBc Ab total.

In 2011 a total number of 34,412 were screened for TTI and show 227(0.66%) were positive for HBs Ag, 44(0.13%) were positive for HCV Ab, 2 (0.006%) were positive for HIV1/2 Ab, zero % were positive for RPR, and 1,908 (5.5%) were positive for HBc Ab total.

The overall prevalence of HBs Ag, HCVAb, HIV1/2 Ab, RPR and HBc Ab total were 0.8%, 0.15%, 0.02%, 0.006%, and 6.4% respectively.

**Conclusion:** This study shows that a substantial percentage of the blood donors harbor HIV, HBV, HCV and syphilis infections so the use of sensitive screening test for these TTI and establishment of strict guidelines for blood transfusion are highly recommended to reduce the incidence of them, thus ensuring safe blood supply to the recipients.

**Key words:** Transfusion transmitted infection, Human immunodeficiency virus, Hepatitis B virus, Hepatitis C virus, Syphilis

## Introduction

Blood transfusion services (BTS) is an essential part of the health care system; it ensures adequacy, efficiency and safety of blood supply. (1)

Blood transfusion is a life saving procedure which carries a major risk. Transfusion of Blood is associated with many complications, some of which are minor while others are life threatening that need more proper pretransfusion testing and screening.

To improve blood transfusion safety, The World Health Organization (WHO) recommends an incorporated protocol that includes establishing a well-organized blood transfusion service, giving the priority of blood donation from voluntary unpaid donors, screening of donated blood for the major transfusion-transmissible infections (TTI) with quality-assured assays, and applying effective quality control systems. (2)

There is a 1% chance of transfusion associated complications including transfusion transmitted infections (TTI) with every unit of blood transfused. (3)

The major concern of blood transfusion transmitted infections is Human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) because they can cause life-threatening disorders. (4)

Syphilis is also a systemic disease caused by *Treponema pallidum*. Transfusion transmitted infections are a major concern to patients and physicians who wish for a safe blood supply. Proper selection of blood donors with low TTI risk and efficient laboratory screening play a critical role in reducing the risk of TTI in the last 20 years. (5, 6)

The aim of the present study was to find out prevalence of transfusion transmitted infections (TTI) in voluntary and replacement donors in our hospital transfusion service set up. This study also aids in evaluating the safety of the collected donations.

## Materials and Methods

The present study was carried out in Blood Bank of King Hussein Medical Center over 3 years from January 2009 through to December 2011. We determined among blood donors at Princess Iman Center for research and laboratory medicine the seroprevalence of human immunodeficiency virus (HIV), hepatitis C virus (HCV), hepatitis B virus and syphilis.

Sera of all donors were tested using commercial kits relying on enzyme linked Immunosorbent assay for HBV, HCV and HIV, and using RPR for syphilis.

Qualitative detection of HBs Ag was carried out using (Bioelisa). Each donor's serum sample was screened for HIV-1 and HIV-2 Ab using Biorad (Genscreen HIV1/2 version2), and HCV Ab screening is carried out using Murex anti HCV version 4 following the manufacturer's instructions.

For in vitro diagnostic use the IMMULITE 2000 systems analyzers for the qualitative detection of total antibodies against hepatitis B core antigen (HBc Ab-total) in human serum was used. IMMULITE Anti-HBc Ag controls are assayed, tri-level controls intended for use with the immulite 2000 Anti-HBc Ag assays. Negative control: containing human serum non reactive to HBc Ag, low positive control and positive control containing human serum reactive to HBc Ag.

Screening for Syphilis is carried out using RPR (Rapid plasma regains) confirmed by TPHA (*Treponema pallidum* hemagglutination). Tests were performed according to the manufacturer's instructions. All the reactive samples were repeated in duplicate before labeling them seropositive. The donated blood was discarded whenever the donor sample was found positive for any TTI.

## Results

A total of 94,270 blood donor records from year 2009 to 2011 at King Hussein Medical Center were apparently healthy adults 30% voluntary (motivated blood donor, who donates at regular intervals) and 70% replacement (usually one time blood donor only when a relative is in need of blood). Blood donors who were included in the study were healthy men and non-pregnant non lactating women between 18 and 69 years, with hemoglobin levels above 13.5 g/dl for males and 12.5 g/dl for females and weighing > 50 kg. Exclusion criteria included: those with a history of jaundice, serious illness, operation, radiotherapy or any form of cancer therapy, current history of medication, blood transfusion. The largest proportion of donors (39%) were in the age ranging from 35-50 years as shown in Table 1 (next page). 87% of donors were males while 13% were females.

As shown in Table 2 and Table 3, a total number of 94,270 blood donors from year 2009 to 2011 at King Hussein Medical Center were screened for HBs Ag, HCV Ab, HIV1/2 Ab, RPR and HBc Ab total at Princess Iman Center for research and laboratory medicine.

In 2009 a total number of 28,315 were screened for TTI and show 245(0.86%) were positive for HBs Ag, 44(0.15%) were positive for HCV Ab, 13 (0.05%) were positive for HIV1/2 Ab, 6(0.02%) were positive for RPR, and 1,861 (6.57%) were positive for HBc Ab total.

In 2010 a total number of 31,543 were screened for TTI and show 293(0.92%) were positive for HBs Ag, 57(0.18%) were positive for HCV Ab, 4 (0.012%) were positive for HIV1/2 Ab, zero % positive for RPR, and 2,305 (7.3%) were positive for HBc Ab total.

In 2011 a total number of 34,412 were screened for TTI and show 227(0.66%) were positive for HBs Ag, 44(0.13%) were positive for HCV Ab, 2 (0.006%) were positive for HIV1/2 Ab, zero % positive for RPR, and 1,908 (5.5%) were positive for HBc Ab total.

Table 1: Age distribution for blood donors

Age range (years)	(18-24)	(25-34)	(35-50)	(51-69)
Donors percentage	16%	36%	39%	9%

Table 2: TTI among blood donors (2009-2011)

Year	Total number of donors	HBs Ag positive	HCV Ab Positive	HIV1/2 Ab Positive	RPR positive	HBc Ab total positive
2009	28315	245	44	13	6	1861
2010	31543	293	57	4		2305
2011	34412	227	44	2		1908

Table 3: Prevalence of TTI among blood donors (2009-2011)

Year	HBs Ag	HCV Ab	HIV1/2 Ab	RPR	HBc Ab total
2009	0.86%	0.15%	0.05%	0.02%	6.57%
2010	0.92%	0.18%	0.012%	0	7.3%
2011	0.66%	0.13%	0.006%	0	5.5%

As shown in Table 4 the overall prevalence of HBs Ag, HCVAb, HIV1/2 Ab, RPR and HBc Ab total were 0.8%, 0.15%, 0.02%, 0.006%, and 6.4% respectively.

Table 4: Overall prevalence of TTI over 3 years' study

TTI	HBs Ag	HCV Ab	HIV1/2 Ab	RPR	HBc Ab total
Prevalence	0.8%	0.15%	0.02%	0.006%	6.4%

All the blood units with positive results for HBs Ag, HCVAb, HIV1/2 Ab, RPR and HBc Ab total were discarded.

## Discussion

Hepatitis B surface Antigen (HBs Ag) is the most common method used to detect hepatitis B infection, but using this marker alone in diagnosis of hepatitis B infection is not efficient because it is not detected during the window phase, so other markers of HBV infection are used. This will prevent the risk of transmitting hepatitis B infection.

Anti-HB core total is the marker that is used as a screening test for hepatitis B virus infection in the window phase. This test detects the presence of both IgM and IgG antibody to hepatitis B core antigen. This marker appears at the onset of symptoms and persists for life.

As the results in Tables 1 and 2 show that the prevalence of HB c Ab total positive results is much higher than that of HBs Ag positive results, so the number of blood units that were deferred depending on this result is high.

Donated blood should be screened for HCV using HCV Ab that can detect more than 95% of chronic infection but can detect only 50-70% of acute infection. As shown in Table 4 the overall prevalence of HCV Ab was 0.15%.

The Acquired Immunodeficiency Syndrome (AIDS) is caused by human immunodeficiency viruses, HIV-1 and HIV-2. Infection by HIV-1 has a worldwide distribution while HIV-2 infection occurs mainly in West Africa and Europe (7). It is necessary for screening purposes to use antigens from the envelope glycoproteins of both viruses, because they are less cross reactive in addition to the major cross reactive core proteins, to ensure detection of antibodies against both types of virus at all stages following infection (8).

The first specific antibody response for HIV infection may be of immunoglobulin M (IgM) then immunoglobulin G (IgG) (9). Maximum sensitivity for detection of anti-HIV seroconversion is achieved by assays to both IgM and IgG.

RPR is a rapid screening test for syphilis; all positive results should be confirmed and the reactive blood units should be deferred.

The blood units found positive for HBs Ag, HBc AB, HCV Ab, HIV1/2 Ab and syphilis were discarded and those donors were contacted via their phone numbers included in the health questionnaire; this is the approved policy for donor notification in our center.

## Conclusion

This study shows that a substantial percentage of the blood donors harbor HIV, HBV, HCV and syphilis infections so the use of sensitive screening test for these TTI and establishment of strict guidelines for blood transfusion are highly recommended to reduce the incidence of TTI, thus ensuring safe blood supply to the recipients.

## References

- 1- World Health Organization: Universal access to safe blood transfusion. World Health Organization, Geneva ; 2008.
- 2- World Health Organization: Aide-mémoire: Blood safety. World Health Organization, Geneva ; 2002
- 3- Arora D, Arora B, Khetarpal A (2010) Seroprevalence of HIV, HBV, HCV and syphilis in blood donors in Southern Haryana . Indian J Pathol Microbiol 53:308-309
- 4- UNAIDS: Report on the global AIDS epidemic. Geneva , Joint United Nations program on HIV/AIDS; 2002.
- 5- Dodd RY: Current risk for transfusion transmitted infections. Curr Opin Hematol 2007, 14:671-676.
- 6- Maresch C, Schluter PJ, Wilson AD, Sleight A: Residual infectious disease risk in screened blood transfusion from a high-prevalence population: Santa Catarina, Brazil .Transfusion 2008, 48:273-281.
- 7- Clavel, F. (1987). HIV-2: the West African Aids virus. AIDS. 1, 135.
- 8- Denis, F., Leonard, G., et al, (1988). Comparison of 10 enzyme immunoassays for the detection of antibody to human immunodeficiency virus type 2 in West African sera. J. Clin. Microbiol. 26, 1000.
- 9- Gains, H., von Sydons, H., et al., (1988). Detection of immunoglobulin M antibody in primary human immunodeficiency virus infection. AIDS, 2, 11.