*Iranian J Publ Health, 2004, Vol. 33, No. 4, pp.38-42*

# Seroprevalence of Cytomegalovirus, Hepatitis B, Hepatitis C and Human Immunodeficiency Virus Antibodies among Volunteer Blood Donors

***R Moniri**[1], **Z Mosayebii**[2], **GA Mossavi**[3]

[1]*Dept. of Microbiology Kashan University of Medical Sciences, Iran*
[2] *Dept. of pediatrics Kashan University of Medical Sciences, Iran*
[3]*Dept. of Statistics, Kashan University of Medical Sciences, Iran*

## Abstract

The transfusion transmitted infections are potentially dangerous complications of transfusion therapy in immunocompromised patients. The aim of this study was to determine the prevalence of transmissible infections in blood donor population in Kashan, Iran. A total of 600 consecutive sera were tested for CMV-IgM antibody, HBsAg, hepatitis B core (HBc) antibody, hepatitis C (HCV) antibody, and HIV antibody with standard methods. Of the sera tested, 14 specimens (2.3%) were CMV-IgM positive. The frequency of seropositive revealed no significant differences between male and female donors. The frequency rates of CMV-IgM seropositive tests tend to decline with increasing the age. There was no relation between the frequency rates of CMV-IgM seropositive with the educational level, socioeconomic status, marital status, urban dweller and rural resident patients. The prevalence of HBV, HCV, and HIV antibody was 0.5%, 0.5%, and 0%, respectively. These findings implied important clinical applications because detection of CMV positive sera may reduce the risk for transmission of CMV in blood transfusion and thereby decrease the risk on CMV-induced complications.

**Keywords:** *Hepatitis B, Hepatitis C, HIV, CMV, Seroprevalence, Blood donors, Iran*

## Introduction

The safety assessment of the blood supply, the quality of screening procedures, and the risk of transfusion-transmitted infectious diseases in any country can be estimated by review and analysis of the records of blood donors, screening procedures, and the prevalence of serological markers of infectious diseases.

Over the past decade, efforts have been made to quantify the risks of transfusion-transmitted infectious diseases accurately (1-3). Although, numerous analyses on risk of human immunodeficiency virus (HIV) infection have been made, there are fewer reliable estimates of infection rates for the other major transmissible agents by transfusion. Accurate estimations on risk of transfusion-transmitted viral infections are needed in order to monitor the safety of the blood supply and evaluate the yield and cost effectiveness of new screening tests and alternatives to allogenic transfusion. The most direct way to evaluate the transfusion associated risk is to study the rate of infection prospectively in transfusion recipients (4-7).

The current very low risk of transfusion-transmitted infectious diseases makes such studies impractical, however, because an exceedingly large number of recipients are required for the risk to be measured accurately. Alternatively, the infection rate in donated blood samples (their results are negative on routine screening) can be determined by further testing with extremely sensitive assays of viral antigens or nucleic acid (8-11). Such

38 ***Corresponding author:** Tel: +98 361 555 1647, Fax: +98 361 555 8883, E-mail: moniri_re@yahoo.com

studies are too expensive, and may cause some errors at the results for the sensitivity of direct assays for virus.

The greatest threat to the safety of the blood supply is donation of blood by seronegative donors during infectious window period when the donors are undergoing seroconversion phase. Incidence rates of seroconversion require the ability to track large numbers of donors at multiple centers. When rates of seroconversion are combined with estimates of the probability that blood was donated during the donor's windows period, the residual risks of transmitting infectious disease can be calculated.

We present incidence rates of transfusion transmitted among volunteer blood donors for each of four major blood-born viral infections; HIV, CMV, the hepatitis C virus (HCV), and the hepatitis B virus (HBV) during the June, 2001 through April, 2002 in Kashan, Iran. We calculated these rates among people who donated blood and passed all essential screening tests. This study was undertaken to determine the prevalence of transfusion transmitted Infection among volunteer blood donors, the safety offered by the four mandatory tests, HIV, HBV, HCV, and CMV which is not routine in Iran.

## Materials and Methods

This was a descriptive study and was done on healthy volunteer blood donors, whose age were more than 18 years old and referred to the Kashan blood bank from June, 2001 to April, 2002. In sum, a total of 600 consecutive sera were tested for CMV-IgM antibody, HBsAg, hepatitis B core (HBc) antibody, hepatitis C (HCV) antibody, and HIV antibody with standard methods. A demographic questionnaire was filled and then 10 ml venous blood was taken. The blood samples were tested for HBsAg (Enzyme immunoassay, DiaSorin, Italy), HIV1/2 (Enzyme immunoassay, GENSCREEN HIV1/2 version 2, NIPPON BIO-RAD laboratories, Japan), HCV (Enzyme immunoassay, Anti HCV-EIA-Avicenna, 3rd Generation, Moscow Russia), CMV (Trinty Biotech Captia, Cytomegalovirus IgM Enzyme-Linked Immunosorbent Assay, USA). The data were analyzed by the Chi Square and the Fischer's Exact Tests.

## Results

The demographic characteristics of the Volunteer Blood Donors consisting of sex, age, residential distribution and marital status of blood donors are shown in Table 1. Of the sera tested, the positive results for CMV-IgM were 14 (2.3%), for HBV 3 (0.5%), and for HCV 3 (0.5%), while the test results for HIV1/2 were negative at all. The Confidence Interval [$CI_{95}$] for HBV, HCV, and CMV were 0.0 to 0.0107, 0.0 to 0.0107, and 0.011 to 0.035, respectively. The frequency rates of CMV-IgM seropositive results revealed no significant differences between male and female volunteer blood donors but it tend to decline with increasing the age of the donors. There was no relationship between the frequency rates of CMV-IgM seropositive with the educational level, socioeconomic status, marital status, urban dwellers and rural residents. The positive prevalence rate of HBV, HCV, and HIV was 0.5%, 0.5%, and 0%, respectively.

**Table 1:** Demographic characteristics of volunteer blood donors and cytomegalovirus seropositives in Kashan, Iran

| Characteristics | Age (Year) | | | | | Sex | | Residential Status | | Marital Status | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 18-28 No. (%) | 29-38 No. (%) | 39-48 No. (%) | 49-58 No. (%) | ≥59 yr No.(%) | Female No.(%) | Male No.(%) | Urban No.(%) | Rural No.(%) | Single No.(%) | Married No.(%) |
| **CMV Seropositive** | 7(2.6) | 7(3.8) | 0(0) | 0(0) | 0(0) | 1(1.9) | 13(2.4) | 12(2.3) | 2(4.3) | 6(3.1) | 8(2) |
| **Total Blood Donor (%)** | 268(44.6) | 182(30.3) | 96(16) | 41(6.8) | 13(2.2) | 52(8.7) | 48(91.3) | 553(92.2) | 47(8.7) | 193(32.2) | 407(67.8) |

## Discussion

The prevalence rate for hepatitis B infection in whole population in Iran has been declined since 1977 (12). It was reported that the frequency rate of sera positive for HBsAg was insignificantly higher in hemophilic patients than the control group (13). Results of a study showed positive HBsAg in four cases out of 755 (0.53%) with confidence interval [$CI_{95}$], 0.17 to 1.3. Anti-HCV antibody was positive in 73 out of 466 cases (15.7%) [$CI_{95}$], 12.6 to 19.2, but none of 466 patients tested were HIV antibody positive (14). Other study reported 48 cases (0.96%) of hepatitis B out of 4980 samples, and one case (0.02%) of hepatitis C but there was no HIV positive case (15). The results of a study revealed that anti-HCV antibody positive test was 0.57% (16). Our results show that the rate of HBV and HCV antibodies are approximately as same as the rates in healthy individuals in this region (17). This is most probably attributable to the careful screening of donated blood specimens by local transfusion organization centers. Other studies did not report any positive HIV antibody tests among 4390 healthy individuals (12). In the present study, none of the patients was positive for HIV antibody, too. HIV Infection is still rare in Iranian population; however, strict care must be taken to preserve this situation. The results of another study showed that 82% of patients were positive for CMV IgG antibody, and 5% of them were CMV-IgM antibody positive (18). In the present study, there is 2.3% positive for CMV-IgM antibody in blood donors. Although this rate for blood donors is not as high as the rate reported in other studies but it is too high in blood donors.

Transfusion-transmitted infectious diseases can be minimized by appropriate selection of donors, improvements in serologic screening tests for infectious diseases, and reduction in the number of blood transfusions to a minimum compatible rate with the appropriate use of blood and blood components. Serological screening tests are, in the end, the gatekeeper of the safety of blood and blood components for transfusion. The screening of blood donors has special importance in Iran, where altruistic repeat donors are the exception instead of the rule, and the most donations come from new donors whom the prevalence of positive serological tests for infectious diseases is higher than repeat volunteers, who are submitted for periodic screening.

Assessment of the safety of the blood supply, the quality of screening procedures, and the potential risk of transfusion-transmitted infectious diseases in any country can be estimated by reviewing the records of blood donations and screening procedures and determining the prevalence of the serologic markers of infectious diseases. An index of infectious diseases spread through blood transfusion was calculated for each country, indicating in some cases with an unacceptably high risk of infection. It became clear from the analysis that there was a need to establish a continued monitoring system to assess the level and quality of screening for infectious diseases in blood supply centers (19, 20).

We suggest that when blood is transfused to high risk patients especially seronegative low birth weight infants (<1500 grams), and repeat transfusions in a seronegative pregnant women, CMV-IgM should be examined regularly on donors to exclude or reduce the incidence of transfusion associated CMV infection. At the present time, CMV screening marker in blood donor in our country is not practical and routine program.

## Acknowledgements

We gratefully acknowledge the authorities Kashan University of Medical Sciences and Health Services, (Kashan, Iran) for their financial support of this work. We thank Dr. Kamran Dastehgoli for his assistance with the preparation of the manuscript.

## References


1. Dodd RY (1994). Adverse consequences of blood transfusion: quantitative risk estimates. In: Nance ST, Ed. *Blood supply: risk, perceptions and prospects for the future*. Bethesda, Md.: American Association of Blood Banks, PP: 1-24.
2. Kleinman S (1992). Donor selection and screening procedures. In: Nance ST, Ed. *Blood safety: current challenges*. Bethesda, Md.: American Association of Blood Banks, PP: 169-200.
3. Alter HJ (1995). To C or not to C: these are the questions. *Blood*, 85: 1681-85.
4. Aach RD, Szmuness W, Mosley JW et al (1981). Serum alanine amino transferase of donors in relation to the risk of non-A, non -B hepatitis in recipients: the Transfusion-Transmitted Viruses Study. *N Engl J Med,* 304: 989-94.
5. Donegan E, Stuart M, Niland JC et al (1990). Infection with human immunodeficiency virus type 1 (HIV-1) among recipients of antibody-positive blood donations. *Ann Intern Med*, 113:733-39.
6. Nelson KE, Donahue JG, Munoz A et al (1992). Transmission of retroviruses from seronegative donors by transfusion during cardiac surgery: a multi center study of HIV-1 and HTLV-I/II infections. *Ann Intern Med,* 117: 554-59.
7. Alter HJ, Purcell RH, Holland PV, Alling DW, Koziol DE (1981). Donor transaminase and recipient hepatitis: impact on blood transfusion services. *JAMA*, 246: 630-34.
8. Alter HJ, Epstein JS, Swenson SG et al (1990). Prevalence of human immunodeficiency virus type 1 p24 antigen in US blood donors an assessment of the efficacy of testing in donor screening. *N Engl J Med,* 323: 1312-17.
9. Busch MP, Eble BE, Khayam-Bashi H, et al (1991). Evaluation of screened blood donations for human immunodeficiency virus type 1 infection by culture and DNA amplification of pooled cells. *N Engl J Med*, 325: 1-5.
10. Kleinman S, Alter H, Busch M, et al (1992). Increased detection of hepatitis C virus (HCV) - infected blood donors by a multiple-antigen HCV enzyme immunoassay. *Transfusion,* 32: 805-13.
11. Aach RD, Stevens CE, Hollinger FB, et al (1991). Hepatitis C virus infection in post-transfusion hepatitis-an analysis with first-and second-generation assays. *N Engl J Med*, 325: 1325-29.
12. Amini S, Mahmoodi MF, Andalibi S, Solati AA (1993). Seroepidemiology of hepatitis B, delta and human immunodeficiency virus infections in Hamadan province, Iran: A population based study. *J Trop Med Hygiene***,** 96: 277–87.
13. EbrahimPoor S, Yaghoobi M, Gharamaleki V et al (1997). Seropidemiological studies of hepatitis B and C in haemophiliacs in northwestern Iran. *Irn J Med Sci*, 22:126.
14. Karimi M and Ghavami AA (2001). Seroprevalence of hepatitis B, hepatitis C and human immunodeficiency virus antibodies among multitransfused thalassaemic children in Shiraz, Iran. *J Paediatr Child Health*, 37: 564–66.
15. Nabavizadeh SH, Haghbeen S (1379). Prevalence of transmitted infection in donors of Yasuji Blood Transfusion Organization. *Journal of Medical Faculty Guilan University of Medical Sciences*, 35-36 (9): 64-7.
16. Sadeghi A, Shariatzadeh MR, Lamei A (1377). Evaluation of hepatitis C virus (HCV) among blood donors in Urmia Transfusion Center. *Urmia Medical Journal,* 4(9): 242-48.
17. Afzali H, Taghavi Ardakani A, Vali G R (1381). Seroepidemiology of hepatitis B and C in blood donors in Kashan, 1996-2001. *Feyz*, 23 (6): 43-50.

18. Radjaii Oskui M (1373). Study of CMV infection in 200 blood donors of national blood Transfusion Center of Tabriz. *Medical Journal of Tabriz University of Medical Sciences & Health Services,* 28(23): 41-6.
19. Schreiber GB, Busch MP, Kleinman SH, Korelitz JJ (1996). The Risk of Transfusion-Transmitted Viral Infections. *N Engl J Med*, 334: 1685-69.
20. Schmuñis GA, Zicker F, Segura EL, del Pozo AE (2000). Transfusion-transmitted infectious diseases in Argentina, 1995 through 1997. *Transfusion*, 40(9): 1048.