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Seroprevalence of cytomegalovirus antibodies among blood donors and Multitransfused recipients – A study from north India

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ABSTRACT

Background and objectives: Primary Cytomegalovirus infection caused by transfusion is a major problem for immunocompromised CMV seronegative patients. Documentation of the status of antibodies to cytomegalovirus in the blood donor pool population is vital to the understanding of the potential likelihood of transmission through donor blood and for determining the best transfusion practices to prevent TT-CMV infection. The present study was conducted to determine the prevalence of CMV infection among blood donors and Multitransfused recipients of north Indian population.

Material and methods: A prospective study was done on 2100 donors' samples and 200 patients sample for CMV antibodies using the ELISA technique.

Results: Out of 2100 donors recruited, 93.8% males and 6.2% females. 98.6% were positive for anti CMV IgG antibodies and only one donor was positive for anti CMV IgM antibody. In Multitransfused patients, out of 200 patients, seroprevalence for anti CMV IgG antibodies was in 100% patients and only one patient was positive for anti CMV IgM antibody.

Conclusion: The study did not demonstrate statistical significant influence of age and gender on prevalence of anti CMV IgG and IgM antibodies. Other preventive strategies such as universal leucodepletion may be implemented to prevent transmission of CMV in immunocompromised patients.

1. Introduction

Cytomegalovirus (CMV) is a ubiquitous, DNA-containing herpes virus belonging to the family of beta herpes viridae [1]. It is usually spread through personal contact with people who excrete the virus in the body fluids including saliva, tears, breast milk, urine, stool, and semen [2]. Besides these, blood transfusion also plays an important role in CMV transmission [3]. CMV infection is asymptomatic in immunocompetent individuals. Seronegative patients at risk for developing significant morbidity from CMV include pregnant women, low birth infants (<1200 g) [4,5], patients with hematological malignancies [6] and thalassaemia [7] and organ transplant recipients [8,9].

Transfusion transmitted CMV (TT-CMV) has been documented in a wide variety of clinical settings and can cause significant morbidity and mortality. It may present as graft rejection or full blown CMV infection [10,11]. The incidence of other transfusion transmitted infections like hepatitis B, hepatitis C and human immune deficiency

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(HIV) has significantly reduced due to stringent pre-donation screening interview and by post donation serologic testing. TT-CMV cannot be reduced by these measures, because donor history cannot discriminate CMV carriers from non-carriers. High prevalence of CMV infection in the donor population also makes the matter worse because universal provision of CMV seronegative products for transfusion is not feasible, as it will lead to unnecessary discarding of units and reduced blood in the inventory.

The wide spread prevalence of CMV serpositivity makes it difficult for the blood bank to maintain sufficient CMV seronegative blood components. The demand for CMV safe blood has increased recently as the number of transplants has increased and at the same time physicians try to maintain the seronegative status of potential patients at risk. Hence, it is necessary that CMV negative blood components be made available for these high risk patients to prevent the transmission of this virus to susceptible patients.

In order to provide CMV seronegative blood, it is important to estimate the prevalence of CMV in our donor population. There is limited data available regarding the seroprevalence of CMV in north Indian blood donors. The current study was an attempt to address the feasibility of providing CMV seronegative blood to patients with special needs and may help in formulating guidelines for donor screening strategies.

2. Material and methods

The study was conducted in the department of Transfusion Medicine, Government Medical College and Hospital, Sector-32, Chandigarh from January 2011 to July 2012 after approval by the institutional Ethics Committee and written consent was given by the donors and patients.

2.1. Study design

The study was a prospective cross-sectional study.

2.2. Sample size

A total of 2300 samples were evaluated for determining the seroprevalence of IgG and IgM CMV antibodies and was divided into two groups (i) healthy blood donors associated with Department – 2100 no and (ii) 200 patients. Patients group was further categorized into 100 Multitransfused patients and 100 controls. Multitransfused were those who received two or more than two transfusion and control group consisted of patients who do not receive any blood transfusion.

2.3. Donor selection

Both voluntary and replacement that came to donate in-house and camps were included in the study and met directorate general health services (DGHS) donor selection criteria [12].

2.4. Sample collection

Donor's sample was collected in a plain vial at the time of donation, centrifuged and the separated serum would be stored at −40 °C until testing. Patient samples received for routine cross matching would be centrifuged and separated sera would be stored at −40 °C until test is performed.

Sera were screened for the presence of antibodies to CMV using commercially available Eliscan™ CMV IgM/IgG (RFCL limited) kits. The kits were based on the principle of sandwich enzyme immunoassay for detection of IgM and IgG antibodies to CMV in human serum or plasma. The test was performed and the results were calculated according to the instructions of manufacturer.

HBsAg (hepatitis surface B antigen), antihepatitis C (HCV) antibodies and anti- HIV antibodies were detected in 2100 blood donors sample using enzyme immunoassay kits, in the department of Transfusion medicine, as a part of mandatory screening. HBsAg was detected using HEPALISA, a microwell Elisa test for the detection of hepatitis B surface antigen (J.mitra and Co. Ltd.). Anti-HCV antibodies were detected using SD HCV Elisa 3.0. Anti-HIV antibodies were detected using the (J.mitra and Co., Ltd.) for detection of antibodies against HIV1/2. Screening for syphilis was done using RPR card test (Tulip Diagnostics Pvt. Ltd.).

2.5. Statistical analysis

SPSS for windows version 9.0 was used for data analysis. Serpositivity rates were calculated and compared according to the age group and gender. Differences were evaluated using the chi-square test and Student *t*-test. When the p value was <0.05, this was considered as a statistically significant result.

3. Results

Of the 2100 donors, 75% ($n = 1573$) were voluntary donors and 25% ($n = 527$) were replacement donors. There were 1970 (93.8%) male donors and 130 (6.2%) were female donors. The maximum numbers of donors (32.8%) were in the age group of 18–25 years with mean age of donors was 31.25 years (median 31 years, range 18–60 years).

The overall seroprevalence of anti CMV IgG antibodies among healthy donors was 98.6% (2070 out of 2100). We found no significant correlation between the donor age group and the percentage of CMV seropositive donors as shown in Fig. 1.

The relationship between CMV status and the donor sex was evaluated. The seroprevalence of anti CMV IgG antibodies in males was 98.5% and females were 98.6%. No significant difference was noted between CMV seroprevalence and the sexes.

Of the 2100 samples studied for CMV seroprevalence, 0.1% tested reactive for HIV, 1% for HBs Ag, 0.5% for HCV and 0.5% for syphilis. No significant association ($p > 0.05$) was observed as all these donors were reactive for IgG CMV antibodies.

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