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Annals of Biological Research, 2012, 3 (11):5420-5422
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Screening of Cytomegalo virus (CMV) among blood donors – Can we include CMV in Transfusion Transmitted Infection?

S. T. Radhiga, S. Kalpana*, and Mayil Vahanan Natarajan**

Department of Transfusion Medicine, The Tamil Nadu Dr.M.G.R.Medical University

**Department of Epidemiology, The Tamil Nadu Dr.M.G.R.Medical University*

***The Tamil Nadu Dr. M. G. R. Medical University, 69, Anna Salai, Guindy, Chennai 600 032, Tamil Nadu, India*

ABSTRACT

Transfusion Transmitted infection rate has been reduced due to improvement in donor screening. Cytomegalovirus (CMV) infection in susceptible patients is associated with serious morbidity and a high mortality. Transmission of cytomegalovirus infection through blood transfusion is markedly reduced by transfusion of CMV seronegative blood products, or by transfusion of leucodepleted blood products. In immuno compromised patient to whom CMV free products are requested, these viruses can be reactivated in immuno compromised individuals. To detect Cytomegalo virus (CMV) IgM and IgG antibodies among healthy voluntary blood donors in Chennai. Cross-sectional descriptive study. Five hundred participants were recruited among voluntary blood donors at the Tamil Nadu Dr.M.G.R. Medical University and testing was done at the Department of Transfusion Medicine. Socio demographic details and the CMV serologic status of the donors were determined by ELISA. The age, gender, marital status, education level and geographical area of residence of the participants were documented and compared. Among the 500 blood donors recruited male were 72%. Most of the voluntary blood donors were aged 18-20 years (53%) and only 11% were above 30 years of age. Students (68%) and professional (23%) were in vulnerable group for CMV infection. Anti- CMV IgG and IgM positivity was 87.0%, (95% CI 86.45-87.53%), and 0.2% (95% CI 0.2-0.5%), respectively. There was statistical difference between different ages and socio economic status in the prevalence of CMV antibodies. However male had a higher prevalence of CMV antibodies. There is a very high prevalence of cytomegalovirus antibodies among voluntary blood donors at Chennai, almost all blood donors having been exposed to the virus. Since the CMV remains latent within leucocytes after infection inspite of the presence of antibodies in seropositive individuals, leucoreduction of blood products is recommended before transfusion to seronegative susceptible patients.

INTRODUCTION

Cytomegalovirus (CMV) is known to be a major cause of morbidity and mortality following blood transfusion in immunosuppressive adults, however, only 0.4 to 12% of the blood products obtained from seropositive blood donors transmit infection.. In India, it is not mandatory to screen donated blood for CMV in blood banks. The widespread prevalence of CMV seropositivity makes it difficult for some blood banks to maintain sufficient CMV seronegative blood components for patients at risk for CMV disease. Therefore, the most effective way to minimize the risk of CMV transmission in high-risk recipients would be to administer CMV seronegative blood products or leucoreduced blood products[1,2].

Very few studies have been conducted in India to estimate the seroprevalence of this infection in voluntary blood donors. This study was conducted to estimate the seroprevalence of CMV among voluntary blood donors in Delhi, India.

MATERIALS AND METHODS

This study was carried out between the months of January to December 2010 among blood donors. In India, blood donors are volunteers and they are selected based on the following criteria: age between 18 and 60 years; weight >45 kg; haemoglobin >12.0 g/dl; normal blood pressure [BP], pulse, and body temperature; not belonging to any high-risk group. Donors found to be healthy are then permitted to donate blood. Donated blood is routinely screened for Transfusion Transmitted Infection HIV 1 & 2, anti-HCV, and syphilis antibodies, HBsAg, and malarial parasite.

In addition, all the sera were screened for the presence of antibodies to CMV by ELISA (anti-CMV recombinant IgG/IgM; Dade Behring, Marburg, Germany) in accordance with the manufacturer's instructions. Positive and negative standard sera, accompanying the kit were included in each assay. Statistical analysis of the data was performed by calculating the Odds Ratio (OR) and the corresponding 95% confidence intervals in the comparison of the age group having the lowest seropositivity rate with other age groups, and then performing the Chi-square test. P values <0.05 were considered statistically significant.

RESULTS

Among the 500 blood donors recruited male were 72%. Most blood donors were aged 18-20 years (53%) and only 11% were above 30 years of age. Students (68%) and professional (23%) were in vulnerable group for CMV infection. Anti- CMV IgG and IgM positivity was 87.0%, (95% CI 86.45-87.53%), and 0.2% (95% CI 0.2-0.5%), respectively. There was statistical difference between different ages and socio economic status in the prevalence of CMV antibodies. However male had a higher prevalence of CMV antibodies.

Of the 500 blood donors, 360 (72%) were males and 28 (10.6%) were females. Fifty three blood donors were aged between 18-20 years and only 11% were above 30 years of age. Their mean age was 32.1 years (range 18 to 64 years). Students (68%) and professional (23%) were in vulnerable group for CMV infection. Sera reactive to ELISA test were considered as positive; CMV prevalence rate was 78%. And rests of them were negative for both IgM and IgG.

Table:1 Comparison of CMV with age group

Age group in years	CMV antibody positive (n=436)	p-value
18-20	231(53%)	<0.001
21-30	157(36%)	
31-40	41 (9%)	
>41	7 (2%)	

Table 1- shows the combined results of CMV IgG seropositivity and age of blood donors. About 231 (53%) percent of the donors aged between 18 to 20 years were seropositive for CMV, as against 9% (41/436) in 31 to 40 years, 2% (7) in >40 years. There was statistically significant difference ($P<0.05$) in the CMV IgG status in different age groups. The blood donors comprised largely of male donors (70%), making sex comparisons statistically undesirable. However, among female 21% (20/28) donors were positive for CMV IgG. Only 0.4% was positive for Hepatitis infection and CMV IgM positive was 87%, it shows the carrier status of CMV antibody.

Table :2 TTI infections among voluntary blood donors

TTI	Number of cases (n=500) Positive	Negative	Percentage
HBsAg	2	488	0.4%
CMV			
IgM	1	499	0.2%
IgG	435	165	87%

Table 3 shows that the prevalence of CMV was high in middle class people and there was a statistically significant association with socioeconomic status of donors and CMV infection.

Table:3 Comparison of SES and CMV

SES	CMV positive (n=436)	P-value
High	13	< 0.001
Middle	363	
Low	60	

DISCUSSION

The results of this study showed an overall prevalence rate of 87% of CMV IgG among blood donors at Chennai, suggestive of ubiquitous past exposure to infection. On the other hand, only 0.2 of the donors tested positive for CMV IgM, indicating the less primary infection. The high seroprevalence rate in adult blood donors reported in this study is comparable to the rates (97% and 96%) reported in Tunisia and India, respectively [3-5]. The high prevalence rate in the country indicates the endemicity of infection, and this perhaps could be related to socio-economic, environmental, and climatic factors. In the study reported herein, the seroprevalence of CMV IgG among the blood donors varied with age. Despite this limitation, the results are similar to studies reported elsewhere which showed a significantly increased seropositivity with increasing age of blood donors[6,7]. However, there was statistically significant difference ($P<0.05$) in the CMV IgG serostatus with age. Since about 87% of blood donors at the Chennai were seropositive for CMV, it would therefore be very useful to screen blood donors for CMV to identify the very few CMV-seronegative blood donors, and maintain an inventory of them for use as donors for immunosuppressed individuals. Furthermore, we propose that the future strategies for the prevention and/or reduction of TT-CMV should include the routine screening of donor blood for CMV antibodies as a first step.

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