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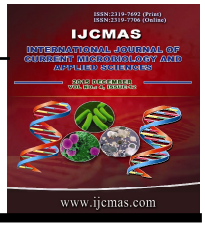

Original Research Article

Seroprevalence of Cytomegalovirus among Blood Donors

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A B S T R A C T

Human Cytomegalovirus (CMV) is one of the most significant pathogens infecting immunosuppressed individuals. CMV is known to be a significant cause of morbidity and mortality following blood transfusion in immunocompromised individuals. The immunosuppressed population for whom CMV free blood products are requested is increasing due to advances in medical care. The most effective way to minimize the risk of CMV transmission in high risk recipients would be to administer CMV free blood products. The study was performed to find out the seroprevalence of Human CMV among voluntary blood donors in Tirunelveli.A total of 92 voluntary blood donors were tested for IgM and IgG anti-CMV antibodies by ELISA technique .Demographic details and laboratory results were analyzed. Among the 92 donors, 82 (89%) were males and 10 (11%) were females. It was found that 7 (7.6%) donors were positive for IgM and 76 (82.6%) donors were positive for IgG.Human CMV is highly prevalent and is a threat to the safety of blood transfusion. Hence it would be useful to screen blood donors for CMV to identify the CMV seronegative donors to maintain an inventory and use them as donors for immune compromised patients .Other preventive strategies like leukoreduction or pathogen inactivation can be made available to prevent CMV transmission.

Introduction

Cytomegalovirus (CMV), a member of the human herpes family of viruses, transmissible through blood transfusions, is an important cause of concern worldwide.(Chakravarti.et al,2009).CMV is a ubiquitous organism found universally in all geographic locations. However, CMV is more common in developing countries and in people belonging to lower socio-economic status. Like most other herpes viruses, they remain latent in the host after primary infection and persist for lifelong in the organism. Nevertheless, these viruses can be reactivated in immunosuppressed individuals and can be an important cause of morbidity and mortality.(Zhuravskaya.et al,1997)

CMV can be transmitted by blood transfusion, transplacental route or by transplantation of hematopoietic stem cells and solid organs from infected donors. Most

studies suggest that 13-38% of immunocompromised patients will contract CMV from transfusion of unscreened and unfiltered cellular blood components.(Ping-Ing et al.1991, Miller et al,1991).Therefore, the most effective way to minimize the risk of CMV transmission in high risk recipients would be to administer CMV free blood products. The immunosuppressed population for whom CMV free blood products are requested is increasing due to advances in medical care.(Miller et al.2001)In view of the increasing demand for CMV free blood products, this study was performed to determine the seroprevalence of CMV antibodies among voluntary blood donors.

Materials and Methods

This prospective study was carried out in Microbiology Department, Tirunelveli Medical College hospital, TamilNadu, India from April 2014 to September 2014.The study protocol was approved by the ethical committee of the institution. The blood donors gave written informed consent to participate in the study. Blood Samples obtained in the Microbiology Department were separated into sera and stored at - 20˚C until for serology testing. All laboratory works were undertaken in the Microbiology laboratory

Sample collection

The blood donors were selected based on the following criteria: age between 18 and 60 years; weight >45kg; haemoglobin >12.0 g/dl; normal blood pressure [BP], pulse, and body temperature; not belonging to any high risk group (homosexually/heterosexually promiscuous, intra-venous drug addicts; patients of sexually transmitted diseases; and no history of any severe current or chronic illnesses). Donors found to be healthy were then permitted to donate blood. Donated blood was routinely screened for HIV 1 & 2, HBsAg, anti-HCV and syphilis antibodies.

Laboratory Methods and Procedures

All laboratory works were undertaken in the Microbiology laboratory. Sera were screened for the presence of IgM and IgG antibodies to CMV by ELISA in accordance with the manufacturer's instructions.

Results and Discussion

The seroprevalence of CMV antibodies in the study subjects is shown in **Figure 1.** Out of the 92 subjects whose sera were tested by ELISA, 7 (7.6%) tested positive for IgM and 76 (82.6%) tested positive for IgG. All the 7 donors who tested positive for IgM also tested positive for IgG antibodies.

In the sex distribution of CMV antibodies among the study subjects shown in **Table 1**, it is seen that out of 82 males, 7 (8.5%) were positive for anti-CMV IgM and 68 (83%) were positive for anti-CMV IgG. Among the 10 females, none tested positive for anti-CMV IgM while 8 (80%) were positive for anti-CMV IgG.

The age distribution of CMV antibodies is shown in Table 2. Among the 61 donors between 18-24 years, 4 (6.6%) tested positive for anti-CMV IgM and 49 (80.33%) tested positive for anti-CMV IgG. Among the 20 donors between 25-30 years, 2 (10%) tested positive for anti-CMV IgM and 18 (90%) tested positive for anti-CMV IgG. Among the 8 donors between 31-35 years, 1(12.5%) tested positive for anti-CMV IgM and 7(87.5%) tested positive for anti-CMV IgG. Among the 3 donors between 36-40 years, none tested positive for anti-CMV IgM and 2 (36.7%) tested positive for anti-CMV IgG.

The marital distribution of CMV antibodies is shown in Table 3. Out of the 72 single study subjects, 7(9.7%) were positive for anti-CMV IgM while 58(80.6%) were positive for anti-CMV IgG. Among the 20 married study subjects, none tested positive for anti-CMV IgM while 18(90%) tested positive for anti-CMV IgG.

The prevalence of CMV antibody among the different occupational groups is shown in **Table 4.** Out of the 1 semi-profession tested, anti-CMV IgM was negative and anti-CMV IgG was positive (100%). Out of 8 shop owners and farmers tested, 1(12.5%) was positive for anti-CMV IgM and 7(87.5%) were positive for anti-CMV IgG.

Out of the 8 skilled tested, 2(25%) tested positive for anti-CMV IgM and 5(62.5%) tested positive for anti-CMV IgG. Out of the 14 semi-skilled tested, none were positive for anti-CMV IgM while all 14(100%) were positive for anti-CMV IgG. Out of the 6 unskilled tested, none tested positive for anti-CMV IgM while all 6(100%) tested positive for anti-CMV IgG. Out of the 55 students tested, 4(7.3%) tested positive for anti-CMV IgM and 43(78.2%) tested positive for anti-CMV IgG

Although blood transfusion saves millions of lives worldwide each year, recipients of the blood or blood product transfusions stand the risk of becoming infected with blood-borne diseases such as Cytomegalovirus (CMV) through transfusion of infected blood and blood products .The results of this study showed a prevalence rate of 82.6% of CMV IgG among voluntary blood donors indicating past exposure to infection while 7.6% of the donors tested positive for CMV IgM indicating primary infection. The high seroprevalence rate of CMV IgG in adult blood donors reported in this study is comparable to the rates (87% and 84-96%) reported in Chennai and Pondicherry (Radhiga et al,2012, Madhavan et al,1974).

The prevalence of CMV IgM (7.6%) in our study is in concordance with a study conducted by Amarapal et al,2001 who reported 9.52% of CMV IgM among Thai blood donors. In contrast Radhiga et al reported 0.2% (Radhiga et al,2012) and Kothari et al reported 0% of CMV IgM , while Oladipo et al reported 28% of CMV IgM. These reflect donors with recent infection or reactivation.

The high seroprevalence rate indicates endemicity of infection, related to socioeconomic, environmental and sanitary conditions. The subjects in the age range 18-24 years had the highest CMV antibody in the study and this represents the age range that CMV infection commonly develops. Also since CMV IgG antibodies are the highest in this group, it also indicates past infection during childhood. There is a predominance of males among the study subjects in Tirunelveli.

The male subjects exhibit a higher seroprevalence of both CMV IgG and IgM compared to females. Prevalence of anti-CMV IgM (9.7%) and anti-CMV IgG (80.6%) is higher among single individuals than in married subjects due to the fact that single individuals are more likely to engage in behaviour that may put them at risk more than married individuals. It is seen that the prevalence of anti-CMV IgM (7.3%) and anti-CMV IgG (78.2%) is higher among students who also contribute to a majority of the donors. The high seroprevalence of both of anti-CMV IgM (7.6%) and of anti-CMV IgG (82.6%) among blood donors in our study suggests that this virus is one of the major transfusion transmissible viral infections and poses a major challenge for blood safety.

Table.1. Sex Distribution of Cytomegalovirus (CMV) antibody among the study subjects

Sex	Number of Subjects Tested	No of anti-CMV IgM Positive Subjects (%)	No of anti-CMV IgG Positive Subjects (%)
Male	82 (89%)	7 (8.5%)	68 (83%)
Female	10 (11%)	-	8 (80%)
Total	92 (100%)	7 (7.6%)	76 (82.6%)

Table.2. Age Distribution of Cytomegalovirus (CMV) antibody among the study subjects

Age	Number of Subjects Tested	No of anti-CMV IgM Positive Subjects (%)	No of anti-CMV IgG Positive Subjects (%)
18-24 years	61 (66.3%)	4 (6.6%)	49(80.33%)
25-30 years	20 (21.7%)	2 (10%)	18 (90%)
31-35 years	8 (8.7%)	1 (12.5%)	7(87.5%)
36-40 years	3 (3.2%)	-	2 (66.7%)
41-60 years	-	-	-
Total	92 (100%)	7 (7.6%)	76 (82.6%)

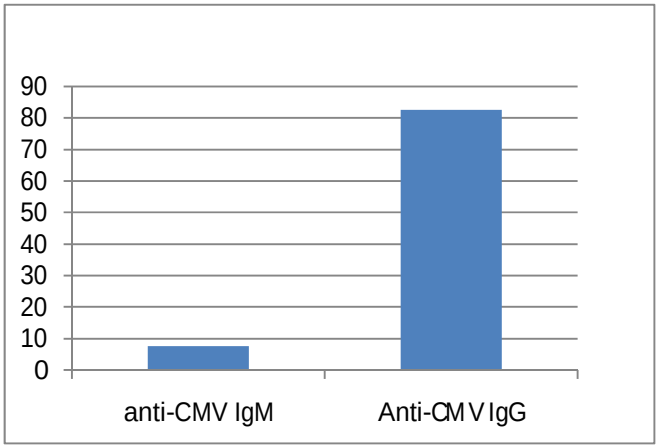
Table.3. Marital Distribution of Cytomegalovirus (CMV) antibody among the study subjects

Marital Status	Number of Subjects Tested	No of anti-CMV IgM Positive Subjects (%)	No of anti-CMV IgG Positive Subjects (%)
Single	72 (78.2%)	7 (9.7%)	58 (80.6%)
Married	20 (21.8%)	-	18 (90%)
Total	92 (100%)	7 (7.6%)	76 (82.6%)

Table.4. Occupational Distribution of Cytomegalovirus (CMV) antibody among the study subjects

Occupation	Number of Subjects Tested	No of anti-CMV IgM Positive Subjects (%)	No of anti-CMV IgG Positive Subjects (%)
Profession	-	-	-
Semi-profession	1 (1.1%)	-	1 (100%)
Shop owner, Farmer	8 (8.7%)	1 (12.5%)	7 (87.5%)
Skilled	8 (8.7%)	2 (25%)	5 (62.5%)
Semi skilled	14 (15.2%)	-	14 (100%)
Unskilled	6 (6.5%)	-	6 (100%)
Unemployed	-	-	-
Student	55 (59.8%)	4 (7.3%)	43 (78.2%)

Figure.1. Seroprevalence of CMV antibodies in study population



Hence it would be useful to screen blood donors for CMV to identify the CMV seronegative donors to maintain an inventory and use them as donors for immune compromised patients. Since infections are more common among youth, infection control measures should be targeted at them. Hence routine screening of donor blood for CMV antibodies must be done.

Since the seroprevalence of CMV among blood donors in India is high, it would be superfluous to screen blood donors for CMV as very few seronegative blood units would be available for transfusion. Other preventive strategies, such as leukoreduction filtration, saline-washed RBCs, frozen deglycerolized RBCs, etc., are being increasingly recommended to minimize the transmission of CMV through transfusion. These may be more appropriate and cost-effective in the Indian scenario for the prevention of transmission of CMV through infected blood to immunosuppressed individuals. More studies in the Indian context need to be done to elucidate the transmission of transfusion associated CMV before proper guidelines on routine screening for CMV in voluntary blood donors can be formulated.

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