Sero-detection of Cytomegalovirus Antibodies Among Blood Donors in Khartoum State

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Shamsoun Khamis Kafi
National Ribat University

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Sero-detection of Cytomegalovirus Antibodies Among Blood Donors in Khartoum State

Hiba Siddig Ibrahim1, Shamsoun Khamis Kafi2, Abed Al Nagi Mohammed3, Youssef Fidel Allah Hemmed Al Nile4

1,2Department of microbiology, Faculty of Medical Laboratory Science, The National Ribat University.
3,4Department of Microbiology, Faculty of Medical Laboratory Science, Sudan University of Science & Technology

ABSTRACT:
Background: Cytomegalovirus (CMV) belongs to the family Herpesviridae, members of which are among the most important human pathogens. CMV has a worldwide distribution, can infect human and mammals, some of them infect wide range of cells while others infect specific types of cells 1. CMV can be transmitted through contact with body secretions, saliva, breast milk, vaginal secretions, semen, urine and stool. In addition to intrauterine infection of fetus during pregnancy, blood transfusion and organ transplantation2. Most adults have antibodies to the virus, showing that infection is widespread and common 3.

Objectives: The main aim of this study was to investigate the seroprevalence of CMV IgG antibodies among blood donors attending three blood banks, in Khartoum State, and to find out the major risk factors associated with CMV infection among blood donors.

Methodology: In this study a total of 115 subjects were included, of them 75 were blood donors with other 20 medical staff and 20 normal individuals. Data were obtained from subject by questionnaires. Aliquots of five ml of venous blood were collected by venous puncture after disinfecting the site of collection. The collected blood was drawn into plain containers, allowed to clot and then centrifuged at 3000 rpm for 5 minutes. The sera were separated into new sterile containers preserved at -20°C in deep freezer until used. Hemolytic or lipemic or icteric specimens were excluded. All specimens were tested for CMV IgG antibodies using Enzyme-Linked Immunosorbant Assay (ELISA) (DRG Diagnostic, Germany).

Results: In the blood donors, 75 (97.3%) were found positive for Anti-CMV IgG and for other groups 40 (97.5%) were positive Anti-CMV IgG. However, this study showed no direct association between CMV infection and transmission to the ABO and Rhesus blood groups on the target group of CMV IgG prevalence.

Conclusion: Seroprevalence of CMV antibodies was found to be 97.3% for IgG among blood donors with other healthy groups. There was insignificant difference between CMV infection in blood donors and the other risk factors.

Key words: CMV, Seroprevalence, Herpesviridae, immunocompromised.
I. Introduction:
Cytomegalovirus (CMV) belongs to the family Herpesviridae. Members of this family are important human pathogens. They have a worldwide distribution and can infect human and mammals. Some of them infect wide range of cells while others infect specific types of cells. Most CMV infections are asymptomatic, sometimes symptoms may be present, such as infectious mononucleosis in adults, intrauterine infection of fetus can lead to abortions, mental defect and even still birth.

Estimated risk of CMV infection through blood transfusion is about 1-5% per unit of whole blood. This study is conducted to throw light on the rate of CMV infection among blood donors in Khartoum state.

II. Material & Method:
This is a prospective short cross-sectional analytical study, which was conducted in Khartoum Teaching Hospital, Khartoum North Teaching Hospital, and Omdurman Chinese-Friendship Hospitals which are the major hospitals in Khartoum State, from January to March 2011.

In this study a total of 115 subjects were included, 75 blood donors with other 20 medical staff and 20 normal individuals to study the prevalence of CMV. Aliquots of five ml of venous blood were collected by venous puncture after disinfecting the site of collection. The collected blood was drawn into plain containers, allowed to clot and then centrifuged at 3000 rpm for 5 minutes. The sera were separated into new sterile containers preserved at -20°C in deep freezer until used. All blood specimens were tested for presence of CMV IgG antibody by ELISA (DRG Diagnostic, Germany).

The principle of ELISA depends on using the pre-coatedmicrotiter wells with purified CMV antigens that react with diluted sample sera after they are added to the wells. If they contain CMV IgG specific antibodies, these will bind the Ag in the wells. The unbound antibodies are removed by washing after incubation, and then enzyme conjugate added to bind Ag-Abs complex, the excess amount is washed after incubation. After that the substrate solution immediately added to the wells, and then incubated for 10 minutes. The reaction is then stopped by adding high acidity. The result of color is read by microwell illuminometer and then the reading of samples is compared with the control and calibrated.

The test was considered valid and, therefore, accepted if the

- Substrate blank in A1 read the absorbance value lower than 0.100.
- Negative control in B1 read the absorbance value lower than 0.200.
- Standard 1 (Cut-off) in C1 read the absorbance value between 0.300-0.850.
- Positive control in F1 read the absorbance value greater than 0.600.

Calculation of qualitative results
Absorbance value of standard 1 (cut-off) = CO.

CO Absorbance value is between 0.300-0.850.

Interpretation of qualitative results

Positive : Mean OD patient > 1.1*CO.

Grey zone: 0.9 *CO <= Mean OD patient <= 1.1*CO.

Negative : Mean OD patient < 0.9*CO.

In this study the specimens that fell in grey zone were considered as negative after repetition.

III. Results

The seroprevalence of CMV was found to be high among target group.

The results in Table 1 showed that the age of target group had no significant effect (P > 0.05) on CMV IgG prevalence.

Table 1. Age distribution of CMV IgG antibodies among the studied group

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Seroprevalence of CMV IgG antibodies among studied group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total examined</td>
</tr>
<tr>
<td>18-25</td>
<td>51</td>
</tr>
<tr>
<td>26-30</td>
<td>32</td>
</tr>
<tr>
<td>31-35</td>
<td>15</td>
</tr>
<tr>
<td>36-40</td>
<td>9</td>
</tr>
<tr>
<td>41-45</td>
<td>6</td>
</tr>
<tr>
<td>46-52</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>115</td>
</tr>
</tbody>
</table>

*(P>0.05)

The results in Table 2 and 3 revealed statistically insignificant difference (P > 0.05) between males or females and between single or married target group on CMV IgG prevalence.

Table 2. Distribution of CMV IgG antibodies according to sex

<table>
<thead>
<tr>
<th>Target group</th>
<th>Seroprevalence of CMV IgG antibodies among studied group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total examined</td>
</tr>
<tr>
<td>Males</td>
<td>98</td>
</tr>
<tr>
<td>Females</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>115</td>
</tr>
</tbody>
</table>

*(P>0.05)

Table 3. Distribution of CMV IgG antibodies according to marital status

<table>
<thead>
<tr>
<th>Target group</th>
<th>Seroprevalence of CMV IgG antibodies among studied group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total examined</td>
</tr>
<tr>
<td>Single</td>
<td>79</td>
</tr>
</tbody>
</table>
### IV. Discussion

The results obtained in this study are generally consistent with those of previous studies in Sudan and other developing countries, where HCMV infection occurs early in life among infants and children. Our results were in agreement with those previously reported among blood donors by Kumar et al (2008) in India (95%), Adjei et al (2008) in Ghana (93.2%) and Ahmed et al (2006) in Malaysia (97.6%)\(^7,8,9\). However, the results were fairly high compared to those reported among Sudanese blood donors by Kafi et al (2009) in Khartoum and Omdurman (77%)\(^4\). Our results were also higher than those reported in Tirana, Hungary (83%) by Seferi et al (2009), in Santa Catarina, Brazil (89.3%) by do Amaral et al (2008) and in Thailand (52.4%) by Amarapal et al (2001)\(^10,11,12\).

These observed differences in HCMV prevalence in Sudan and other developing countries may, perhaps, be due to the effect of many predisposing factors, such as hygienic circumstances, ethnic and socioeconomic factors, breastfeeding behavior, sexual contacts and the different serological methods used. It is of great interest to note that HCMV prevalence detected through IgG antibodies in this study and the previous reports is quite high (50% -100%) in comparison to other human viral infections (1%-15%) like hepatitis B and C, HIV, rubella and measles. This is, perhaps, due to the fact that in the vast majority of healthy individuals, the immune system quickly reaches homeostasis with CMV\(^2,1\). While the immune system of healthy immunocompetent individuals is usually able to prevent HCMV from producing clinical manifestations, it very rarely completely eliminates CMV from the body (CMV is a latent herpesvirus)\(^5\).

The HCMV IgG seroprevalence among the blood donors increased gradually with age from 95.2% in 26 to 30 years of age to 100% in the 40-52 year age groups. These observations were similar to those recently reported by Redwan et al (2011) in Jeddah, Saudi Arabia\(^5\).

One hypothesis to explain the fairly high prevalence of CMV IgG in the elderly would be that the immune system gets weaker with age\(^13\). Because all blood donors were males, this study found no association between CMV IgG prevalence and sex. However, some minor differences were observed among the target group (100% females, 96.9% males). These findings were similar to those reported by Kumar et al (2008) in India (95.5% males), but different from those observed by Seferi et al (2009) in Tirana, Hungary (82.5% males, 83.5% females)\(^7,10\). However, while there was no significant difference (P>0.05) of CMV IgG prevalence among married blood donors (98%) compared to the single ones (98%), when comparing with target group (97.2% married, 97.4% single). The most common mode of transmission for adults is via exposure to toddlers. CMV infected infants and children actively excrete the virus in their saliva and urine\(^6,1\). Thus, one hypothesis to explain the fairly high CMV prevalence among females, especially the married ones would be that women have more contact with children and have more opportunities to CMV infection during pregnancy, delivery and menstruation\(^5\).
Although previous repeated blood transfusions were associated with increased risk of CMV transmission, this study did not show significant effect of this risk factor on CMV infection among target populations. In fact, only 2 individuals from target group received blood transfusions, a very low number that cannot reflect the real effect of this important predisposing factor.

To our knowledge, no previous study or report examined the effect of the major blood groups on CMV infection and transmission. However, this study revealed no effect of the ABO and Rhesus blood groups on the target group of CMV IgG prevalence, an indication that no direct association of this factor to CMV infection and transmission.

V. Conclusion

Based on the results of this study and the reports of the previous investigations in Sudan among blood donors and other target groups (hemodialysis and organ transplant patients and pregnant women), it is highly suggested that HCMV is not only common, but highly endemic in Sudan. Although not significant, but some predisposing factors have potential effects on HCMV infection.

Acknowledgment

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VI. References


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