Iranian Journal of Virology 2012;6(1): 1-5

Original Article

Seroprevalence of Cytomegalovirus Infection in Blood Donors in Khorramabad

Delfan-Beiranvand M[1*], Pournia Y[2], Fazeli M[3], Tarvand AH[1], Hosseini J[1], Mirzaei M[4]

1. Blood Transfusion Research Center, High Institute for Research and Education in Transfusion Medicine, Khorramabad, Iran.
2. Faculty of Medicine, Lorestan University of Medical Sciences, Khorramabad, Iran.
3. Department of Virology, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran.
4. Department of Laboratory Sciences, Borujerd Branch, Islamic Azad University, Borujerd, Iran.

Abstract

Background and Aims: Cytomegalovirus (CMV) has worldwide distribution, and its prevalence rate depends on factors such as economic and geographical conditions. An important way of the virus transmission is via blood. Due to high prevalence of anti-CMV antibodies in blood donors and lack of data concerning its seroprevalence in the region, this study was carried out to determine the prevalence rate of anti-CMV antibodies in the blood donors of Khorramabad Blood Transfusion Center.

Materials and Methods: This descriptive study was conducted on 270 healthy donors referring to Khorramabad Blood Transfusion Center. The demographic data were recorded in the questionnaires, and following the routine screening tests, the tests of anti-CMV antibodies (IgG and IgM) were performed using the Iranian Pishtaz-teb kit through the ELISA technique. The data were analyzed by the t-test and x^2 test using the SPSS software.

Results: Out of 270 samples, 90% were males, and 10% were females. Anti-CMV IgG antibody was positive in 148 samples (55%), and negative in 122 ones (45%). Moreover, anti-CMV IgM antibody was negative in 269 cases (99.6%), and positive in 1 case (0.4%).

Conclusion: Considering the high seroprevalence of anti-CMV antibody in Khorramabad, latency of the virus inside the blood cells, and its possible transmission via blood and blood products to blood receivers particularly in immunodeficient patients including those with malignant diseases receiving chemotherapy and recipients of allograft transplants, performing screening tests on donated blood samples for CMV infection particularly in high risk cases is recommended.

Keywords: Blood donors; Cytomegalovirus; Antibody; Khorramabad

Introduction

Cytomegalovirus (CMV) is a member of β-Herpesviridae family. It is the largest member (150-200nm) of the family and it cannot be differentiated from other members morphologically. This pathogenic virus has a widespread distribution and can infect individuals at any age (1). CMV is an intracellular organism and belongs to viruses with DNA. The virus can affect various organs in the body and can cause eye infections, gastrointestinal infections, hepatitis, and cytopenia. It sometimes remains latent in cells and is transmitted with blood products asymptomatically (2, 3). In screening tests in

***Corresponding author:** Maryam Delfan-Beiranvand, MSc. Blood Transfusion Research Center, High Institute for research and Education in Transfusion Medicine. Khorramabad, Iran.
Email: Delfanmaryam@gmail.com

[DOI: 10.21859/isv.6.1.1]

Table 1. Frequency distribution of anti-CMV antibodies in blood donors of Khorramabad in terms of age, gender, and place of residence.

Positive anti-CMV antibody	**Gender**		**Age (year)**				**Place of residence**	
Antibody	Male	Female	≤20	21-35	35-50	≥50	Urban	Rural
IgG (Number)	135	13	1	73	58	16	141	7
IgG (Percentage)	55	50	25	54	57	53	55.5	44
IgM (Number)	1	0	0	1	0	0	1	0
IgM (Percentage)	0.4	0	0	0.7	0	0	0.4	0

the Iranian Blood Transfusion Center, blood and blood products are not being examined for CMV. Given the structure and biology of CMV, the transmission of the infection caused by the virus is possible in blood recipients. The problem is particularly important in preterm infants with low birth weight, transplant patients (organs or bone marrow), patients with congenital immunodeficiency, patients receiving immunosuppressants, those with acquired immunodeficiency like AIDS, and thalassemic patients (2, 4, 5). CMV infection has a high prevalence, and a worldwide incidence of 30 to 100% has been reported (6). Therefore, considering the above-mentioned issues, lack of performing screening tests to detect and remove blood samples with CMV, and lack of enough data regarding CMV infection in blood donors in Khorramabad (west of Iran), this study was carried out to determine the prevalence of anti-CMV IgG and IgM antibodies in this city in 2011.

Methods

In this descriptive cross-sectional study, 270 blood samples from healthy voluntary blood donors in Khorramabad Blood Transfusion Center were selected randomly, and evaluated for CMV infection.

Diagnosis of the infection was based on determining anti-CMV IgG and IgM antibody titers through the ELISA technique (Pishtaz-teb kit, Iran). The antigen used in this method was an inactivated and purified CMV that was attached to the solid-phase of a 96-well microplate. Immunoglobulin in human serum was attached to the antigens in the plate during incubation. After washing, the plate was juxtaposed with peroxidase-conjugated anti-IgG and anti-IgM antibodies. After appropriate incubation and washing, the substrate was added. In this condition, the formed color would match the concentration of specific antibodies in the serum. The data of the experiments were recorded in checklists and were analyzed by the t-tests and chi-square tests using the SPSS software.

Results

Out of a total of 270 subjects, 244 (90%) were male and 26 (10%) were female. Moreover, 4 (1%) persons were in the age group of under 20 years, 135 (50%) in the 21-35 age group, 101 (37%) in the 35-50 age group, and 30 (12%) in the age group of over 50 years. Also, 254 (94%) subjects were urban residents and 16 (6%) were rural residents. The titers of anti-CMV IgG antibodies were positive in 148 samples (55%), including 135 (55%) cases in males and 13 (50%) cases in females. One person (25%) aged under 20 years, 73 cases (54%) aged 21-35 years, 58 ones (57%) aged 35-50 years, and 16 cases (53%) aged over 50 years old had positive titers. Out of this number, 141 (55.5%) were urban and 7 (44%) were rural residents. Positivity of IgG titer did not show any significant relationships with age, gender, and place of residence ($p>0.05$),

[DOI: 10.21859/isv.6.1.1]

showing the extent of contamination with the virus, regardless of age, gender, and place of residence (Table 1). Only 1 case (0.4%) was positive in terms of anti-CMV IgM antibody titer, that was in the male group (0.4%), age group of 21-35 years (0.7%), and urban residents (0.4%) (Table 1).

The results showed that 205 (76%) of the blood donors were married, and 65 (24%) were single. The highest anti-CMV IgG-positive cases belonged to married individuals although this relationship was not significant. Only one case of positive anti-CMV IgG titer was found, belonging to a married person.

Analysis of the data regarding the relationship between job and anti-CMV antibodies showed the highest number of cases in the self-employed persons, the highest number of anti-CMV IgG-positive cases in the self-employed and military groups, and the lowest positive cases in the school and university students. The only positive case of anti-CMV IgM titer was reported for an employee with academic degrees.

Discussion

The analysis of 270 blood samples showed that anti-CMV IgG was positive in 148 cases (55%), and negative in 122 (45%). Anti-CMV IgM antibody was reported to be positive only in one case (0.4%). Moreover, 55% of the subjects were positive for anti-CMV IgG antibody titers, showing their previous contact with the virus and the extensive spread of the infection in the studied population in the past. The prevalence rate was reported to be 89.6% in a study conducted in Tehran Blood Transfusion Center (7, 8), 89.2% in Zanjan (9), 100% in Orumieh (10), and 87.5% in Isfahan (11). According to the results of this study, 0.4% of the samples were positive for anti-CMV IgM antibody. The rate was reported to be 2.3% in a study by Tarabadi et al. (12), 3.4% in Zanjan (9), and 2.8% in Orumieh (10). The difference between the prevalence rate in our study and the rates in these studies can be attributed to the differences in sensitivity and specificity of the kits applied to assess the antibodies, climatic and demographic differences, and differences in the gender of the blood donors. A study conducted in Tehran Blood Transfusion Center in 1999 and 2002 on blood donors reported no positive cases for anti-CMV IgM anybody in the female blood donors. The prevalence rate was found to be 1% in mothers of infants following exchange transfusion (13), lower than 1% in pregnant women (14), 0% in women with first pregnancies (15), 0% in women in fertility ages (16) (founding no positive or suspicious cases), and 6.7% in female voluntary blood donors (17).

Our findings are not consistent with the results of a study carried out in Zahedan (17), and the difference can be attributed to level of education, living in crowded families, and socio-economic factors of the region. In addition, our results are in accord with the results reported by other studies (14-16). The slight difference between the results of our study with those in Darakhshan et al.'s study (13) can be due to the physiological conditions of the subjects since they selected all the females from among mothers while most of the female blood donors in our study were school and university students. Moreover, the numbers of subjects and the seasonal and climatic characteristics in the two studies are also different. Because of the importance of the infection and the spread rate of 30 to 100% in different parts of the world (6), numerous seroepidemiological studies have been conducted in other parts of the world, which suggest a high rate of infection in most parts of the world. The prevalence of anti-CMV IgG antibody in blood donors in India was reported to be 95% (18). In this study, no positive cases of anti-CMV IgM antibody were reported. The prevalence rates of anti-CMV IgG and IgM antibodies in blood donors in Alberta, Canada were 40.5% and 0.9%, respectively (19). The results of similar studies in Thailand (20) and Tunisia (21) showed that the prevalence rates of anti-CMV IgG antibody in the blood donors in these two countries were 93.31% and 97.14%, respectively, suggesting previous contact with the virus and the prevalence of the infection in these areas. The results of these studies (20, 21) are not consistent with the

[DOI: 10.21859/isv.6.1.1]

results in the Canadian study (19), showing a direct relationship between the rate of infection and health and economic conditions in various regions of the world.

Conclusion

As the results of the present study and the results of other researches in Iran and the other parts of the world show that transmission of cytomegalovirus to blood receivers particularly immunodeficient patients and its reactivation and the subsequent complications are possible. The reasons are the high prevalence of infection and previous exposure to CMV, the latency of the virus in blood and blood cells particularly in leukocytes. No screening tests for CMV are currently being performed on donated blood samples, the prevalence of the infection is high (55%), and there is a possibility of new infections (0.4%), particularly in high risk cases (organ transplants and immunodeficient individuals). Therefore, performing screening tests for the virus on donated blood samples is recommended.

Acknowledgments

This research was supported and funded by Khorramabad Blood Transfusion Center. We hereby acknowledge the sincere cooperation provided by the manager and the staff of the center.

References

1. Sever JL. Pediatric cytomegalovirus infections. Clin Applied immunol. 2002;3:47-9.
2. Storch GA. Essentials of Diagnostic virology. New York: Churchill Livingstone Co. 2000;203-18.
3. Stango S. Cytomegalovirus. In: Remington JS, Klein JO (editors). Infection Diseases of the Fetus and Newborn Infant. Philadelphia: WB Saunders Co. 1995;312.
4. Taylor-weideman J, Sissons JG, Bory siewicz LK, Sinelair JH. Monocytes are a major site of persistence of human cytomegalovirus in peripheral blood mononuclear cells. J Gen Virus. 1991;72:2059.
5. Sodenberg-Naucler C, Fish KN, Nelson JA. Reactivation of latent human cytomegalovirus by allogeneic stimulation of blood cells from healthy donors. *Cell.* 1997, 91: 119.
6. Yang DT. Leukocyte - reduced, cytomegalovirus screened, and Irradiated blood components: indications and controversies current Issues in transfusion medicine. [Serial online] [Visited on 1993]. Available from: http://www. A ndanderson-org/citm/H-93-40. html.
7. Aghaeipour M., Tarabadi F, Babaei A, Shayegan CH. Seroprevalence of anti-CMV antibodies in patients with major thalassemia, and blood donors. Proceedings of the Sixth Congress of Immunology and Allergy, Tehran - Iran. 2002;90.
8. Trabadi F, Shayegan CH, Babaei H, Talebian HM. Seroprevalence of anti-CMV IgG and IgM antibodies in blood donors. Proceedings of the Fifth Congress of Immunology and Allergy, Tehran - Iran. 2000;94.
9. Asadi MH, Ismailzadeh A. Prevalence of anti-CMV IgG and IgM antibodies in blood donors in Zanjan province, 2004. Journal of Zanjan University of Medical Sciences. 2005;3(52):43-48.
10. Hejazi S, Mullah Abbas Zadeh Z, Karami YM. Prevalence of anti-CMV antibodies in blood donors in Orumieh. Blood Research Quarterly. 2006;3(5):427-435.
11. Roya SH, Rezai A, Dehghanian H. Relative frequency of CMV infection in blood donors. Proceedings of the Fifth Congress of Immunology and Allergy, Tehran - Iran. 2000;70.
12. Moniri R, Mousavi GH A. Prevalence of anti-CMV IgM antibody in Kashandr in 2001. Virology Congress. Tehran - Iran. 2001;150.
13. Darakhshan M, Kaviani S. Role of CMV infection in neonates following exchange transfusion. Gashtak. 1995;3(2):14-16.
14. Ibrahimzade MI. Prevalence of CMV infection in 210 pregnant women in Tabriz in 2001. Proceedings of the First International Congress of Virology, Tehran. 2001;175.
15. Munawari HR, Asqaei M, Nourbakhsh S, Ghazi F. Prevalence of CMV in women with first pregnancies and their infants. Proceedings of the Second International Congress of Virology, 24-26 February - Tehran. 2003;293.
16. Niakan M., Mohseni S, Molaei H. Evaluation of anti-CMV IgG and IgM antibody titers in women in Tehran. Proceedings of the Second International Congress of Virology, 24-26 February - Tehran. 2003;297.
17. Sharifi B, Naeini R, Sanei Moghaddam. Seroepidemiology of cytomegalovirus infections in female blood donors in Zahedan Blood Transfusion

[DOI: 10.21859/isv.6.1.1]

Center. Journal of Women, Obstetrics, and Infertility. 2001;4(7-8):82.
18. Kotnari A, Ramachandran VG, Piyush G, Bharat S, Vibha T. Seroprevalence of CMV among voluntary blood Donors in Dehli, *India. J Health Popul Nutr*. 2002;20(4):348-51.
19. Preiksaitis JK, Desai S, vaudrt W, et al. Transfusion and community - acquired CMV infection in children with malignant *diseases. Transfusion.* 1997;37(9):941-6.
20. Urwijitaroon Y, Teawpetanataworn S, Kitjareontarm A. Prevalence of cytomegalovirus antibody in thainortheasternblood donors. Southeast Asian J Trop Med Public Health. 1993;24 (suppl 1):180-2.
21. Gargouri J, Elleuch H, Karray H, Hammami A. Prevalence of anti-CMV antibodies in blood donors in the sfax region (value in blood transfusion). Tunis Med. 2000;78(8-9):512-7.

[DOI: 10.21859/isv.6.1.1]