



Seroprevalence of Cytomegalovirus among Blood Donor in Transfusion Medicine: Study from Bangladesh

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Abstract

Background: Cytomegalovirus (CMV) infection is a matter for concern among blood bank professionals and blood transfusion recipient, especially in cases of transfusion to neonates and immunocompromised patients.

Objective: The aim of the study was to investigate the seroprevalence of cytomegalovirus with the purpose of determining routine CMV screening for donors.

Method: A descriptive cross sectional study was carried out in the Department of Transfusion Medicine in Bangabandhu Sheikh Mujib Medical University from January 2017 to December 2017. A total of 150 blood donors were selected by convenient sampling technique.

Result: The seroprevalence of cytomegalovirus is 91% for IgG and 4% for IgM. Association was found in between IgG and age, sex. In case of age anti-CMV-IgG, $\chi^2 = 26.5$, $t = 9.49$; $\chi^2 > t$ (Association Exists), for sex anti-CMV-IgG: $df = 1$, $CI = 95\%$, $\chi^2 = 17.8$, $t = 3.84$; $\chi^2 > t$ (Association Exists) Anti-CMV-IgM: $df = 1$, $CI = 95\%$, $\chi^2 = 10.7$, $t = 3.84$; $\chi^2 > t$ (Association Exist). This study was undertaken to find out seroprevalence of Cytomegalovirus among blood donors in the department of transfusion medicine. The incidence of cytomegalovirus is 91.3% for IgG and 4% for IgM. Most of the IgG positive subjects were in 38-47 years and for IgM were in 28-37 years. It was observed that seroprevalence of CMV was more in female (94.9% in case of IgG & 6.8% in IgM). It was observed that the highest prevalence of IgG was 3 out of 3 (100%) in illiterate and that of IgM was 1 out of 3 (33.33%) in illiterate level of education. In conclusion it was found that seroprevalence of cytomegalovirus was 91.3% for IgG and 4% for IgM. Association was found in between IgG & age, sex.

Conclusion: Prospective blood donors should be screened for CMV most especially for immunocompromised recipients. Leucoreduced blood products from CMV seronegative donors should be given to preterm neonates, infants as this will prevent transfusion associated perinatal CMV disease. There should be more campaign and awareness on provision of voluntary blood donation for CMV negative blood. Program should be made to create awareness in the community on the significant impact of CMV infection on health.

Keywords: Cytomegalovirus (CMV), Blood donor, Seroprevalence, Immunoglobulin G (IgG), Immunoglobulin M (IgM).

Introduction

Cytomegalovirus (CMV) is a large, enveloped, double stranded DNA, beta herpes virus primarily associated to cell but may also be found free in plasma and other body fluids. CMV has a direct cytopathic effect on infected cells. The result may lead to neutropenia, some depression of cellular immunity and inversion of T-cell subset ratios, with a consequent increase in susceptibility to bacterial, fungal and protozoa infections in immunosuppressed patients^[1,2]. CMV infection causes parenchymal damage, such as retinitis, pneumonitis, gastroenteritis and encephalitis and can result in substantial morbidity and mortality.

Transmission of CMV via blood transfusion and blood product/component is related to its latency in leucocytes and

consequent contamination of red blood cells as well as platelet component. Transfusion transmitted CMV (TT-CMV) can lead to primary infection in CMV-seronegative recipient or reinfection (super infection) by new strain in CMV seropositive recipient who receives blood component/product from CMV positive donor^[1]. Human beings are believed to be the only reservoir for human CMV (HCMV) and natural transmission occurs by direct or indirect person to person contact. Source of virus include pharyngeal secretion, urine, cervical and vaginal secretions, semen, breast milk, tears, faeces, besides contact with seropositive mothers (passage through genital tract, breast milk etc.). Blood transfusion is the most important mode of prenatal and post natal spread of CMV to neonates^[2].

Cytomegalovirus (CMV) is a ubiquitous organism, found universally in all geographic locations and socioeconomic groups. However, infection with CMV is more common in developing nations and the people belonging to the lower socioeconomic section of the society.

In immunosuppressed subjects 30% of anti CMV negative recipients undergoing cardiac surgery involving transfusion develops infection. Some CMV positive patients develop recurrent infection lead to mononucleosis like syndrome.

Transfusion in patients with impaired immunity following maternal primary CMV infection, the fetus may become infected in 30-40% cases. About 5-10% of infected infants develop sequel like mental retardation, hearing loss or chorioretinitis^[5].

CMV antibody positive subjects may infect others with CMV by sexual contacts, breast feeding, transplacental transmission and transfusion of blood or blood products^[6]. The aim of the present study was to identify blood donors can infect the recipients with the dreadful virus.

Materials and Methods

Type of study: Cross sectional study.

Time of study: January 2017 to December 2017.

Data Collection instrument: Structured questionnaire.

Setting: This study was carried out in the department of Transfusion Medicine, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka. Serum of blood donor was collected and CMV antibody detected by Latex Particle Agglutination test method.

Study population: Blood donors coming in the department of Transfusion Medicine, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka.

Sampling procedure: Convenient sampling technique. Sample was selected under following inclusion and exclusion criteria.

Inclusion Criteria: Any adult individual who was in good health and had not suffered from any recent serious illness. Provided he/she was in between 18-60 years of age. Hemoglobin value lower limit 12gm/dl. Weight is not below 50 kg. Temperature (oral) is about 99°F. Blood pressure-systolic within 100-200mmof Hg and diastolic within 60-100mmof Hg. Pulse 60-100 beat/minute and regular. Free from transmissible disease (HBV, HCV, malaria, syphilis, HIV) after doing screening test.

Exclusion criteria: Under the age of 18 years and above the age of 60 years. Surgery with blood transfusion. Recent acupuncture, tattoo, ear or body piercing.

Data analysis

All the relevant collected data was compiled on a master chart first and then analysis of the result was obtained by using window based computer software devised with Statistical Package for Social Sciences (SPSS-22) (SPSS Inc, Chicago, IL, USA). The subgroup was analyzed for risk factor identification by using Chi square test.

Results

Table 1: CMV Prevalence in Blood Donors
CMV Prevalence in Blood Donors

	Anti-CMV: IgG	Anti-CMV: IgM
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	No.	Percentage	No.	Percentage
Positive	137	91.3%	6	4.0%
Negative	13	8.7%	144	96.0%

Table-1 shows the CMV prevalence of the study subjects; it was observed that out of 150, 137 (91.3%) was Anti-CMV: IgG positive and 6 (4.0%) was Anti-CMV: IgM positive.

Table 2: CMV seroprevalence according to age (years)
CMV seroprevalence according to age (years)

		Anti-CMV: IgG		Anti-CMV: IgM	
Age	No. tested	No.	Percentage	No.	Percentage
18-27	28	23	82.1%	1	3.03%
28-37	38	34	89.5%	3	5.58%
38-47	42	39	92.9%	1	2.70%
48-57	39	38	97.4%	1	3.84%
58& above	3	3	100.0%	0	0%

Anti-CMV-IgG: df = 4, CI = 95%, $\chi^2 = 26.5$, t = 9.49; $\chi^2 > t$ (Association Exists)

Anti-CMV-IgM: df = 4, CI = 95%, $\chi^2 = 5.9$, t = 9.49; $\chi^2 < t$ (No Association)

Table 2: shows seroprevalence according to age (years) of the study subject. It was observed that the highest number of respondents was from age group 38-47 with a total of 42 (28%) donor. The lowest number of respondents came from the age group 58 years & above, total 03 (2%). For prevalence determination, it was found that IgG prevalence was highest in the age group of '58 years & above'; total number 3 out of 3 (100%) and lowest prevalence of IgG group was in 18-27 year; total number 23 (82.1%). For IgM, prevalence was highest in the age group 28-37 year; total number was 3 (5.88%).

Table 3: CMV seroprevalence according to sex
CMV seroprevalence according to sex

Positive		Anti-CMV: IgG		Anti-CMV: IgM	
Sex	No. tested	No.	Percentage	No.	Percentage
Male	91	81	89.0%	2	2.2%
Female	59	56	94.9%	4	6.8%

Anti-CMV-IgG: df = 1, CI = 95%, $c^2 = 17.8$, t = 3.84; $c^2 > t$ (Association Exists)

Anti-CMV-IgM: df = 1, CI = 95%, $c^2 = 10.7$, t = 3.84; $c^2 > t$ (Association Exist)

Table 3: shows CMV seroprevalence according to sex. It was observed that the maximum respondents of this study was male 91 out of 150 (60.67%) and that of female 59 (39.33%) and prevalence of CMV IgG in male & female was 89.0% and 94.9% respectively and for IgM prevalence was 2.17% and 6.89% for male & female respectively.

Table 4: CMV seroprevalence according to educational status
CMV seroprevalence according to educational status

		Anti-CMV: IgG		Anti-CMV: IgM	
Education	No. tested	No.	Percentage	No.	Percentage
Illiterate	3	3	100.0%	1	33.33%
Primary level	26	25	96.15%	2	6.89%
Secondary	51	47	92.15%	2	3.92%

level					
Higher Education	70	61	87.14%	1	1.42%

Table 4 shows CMV seroprevalence according to educational status. It was observed that the highest prevalence of IgG was 3 out of 3 (100%) in illiterate group and that of IgM was 1 out of 3 (33.33%) in illiterate group of education and the lowest prevalence of CMV IgG was 61 out of 70 (87.14%) and for IgM prevalence was 1 out of 70 (1.42%).

Discussion

In this study prevalence of anti-CMV IgM antibodies found to be 4% which is close to the figures reported in Albania^[7] (5.5%) and Benin and Nigeria^[8] (3.1%). Studies from Brazil, Sudan and Ilorin reported nearly comparable anti-CMV IgM antibody rates of 2.3%, 2.5%, and 2.2% respectively^[9]. The high anti-CMV IgM prevalence record in Iran (85.0%)^[10], which contrasted with the finding of this study. This could be attested to the fact that numerous studies in some region of Iran have had different results with high prevalence regarding the prevalence and seropositivity of anti-CMV IgM, as reported by Sepehrvand^[11] and Amin-Zadeh^[12]. This high prevalence of anti-CMV IgM may not be unconnected with certain cultural practices in Iran such as kissing children to show love and bonding. Mollison et al.^[13] Added to this by citing that most children are infected very early in life and reinfection continuous in addition to vertical infection from mother to child.

Combined CMV IgM and CMV IgG antibodies were higher than 1.6% reported by Chaudhari and Bindra^[14]. A significant portion of CMV infection are symptomatic, their ability to find sanctuary in peripheral blood monocytes coupled with episodes of recrudescence makes re-infection and/or activation a common event. Therefore re-activation like de-novo infection is associated with a CMV IgM response. Individuals who suffer a re-activation have previously mounted a CMV IgM response. Therefore anti-CMV IgG prevalence rates are considered to reflect the overall prevalence for epidemiologic purpose^[15].

Females were more at risk of infection similar observations were reported in California this is contrary to the report in India. The prevalence of CMV raise with donors age specially for multiparous women but not significantly, a pattern similar to the observation by Seferi and colleagues^[16]. Low educational level did not significantly increase the risk for CMV infection, but the odds are increased three-folds. A similar pattern was seen in the study by Dowd and colleagues^[17]. This study indicates that the prevalence of CMV antibody is inversely proportionate to the level of educational attainment which is statistically insignificant but the contrary was observed in a similar trend reported in California and Sudan in which individuals with lower educational level had significant higher CMV IgG antibody levels. Therefore, poor education and subsequent poverty are facilitators of CMV spread. Employment was associated with higher likelihood of CMV infection, this is not far from the fact that most employed are at higher risk of engagements with exposure tendencies in terms of occupational hazards^[18].

Conclusion

Prospective blood donors should be screened for CMV most especially for immunocompromised recipients. Leucoreduced blood products from CMV seronegative donors should be given to preterm neonates, infants as this will prevent transfusion associated perinatal CMV disease. There should be more campaign and

awareness on provision of voluntary blood donation for CMV negative blood. Program should be made to create awareness in the community on the significant impact of CMV infection on health.

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