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Seroprevalence of Cytomegalovirus in healthy Voluntary Blood Donors in renowned Jordanian Hospital

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ABSTRACT

Abstract- : Cytomegalovirus (CMV) is one important cause of transfusion-associated in morbidity and mortality infecting immuno-suppressed individuals. Aim: The goal of this study was to determine the seroprevalence of antibodies to CMV in blood donors at KHMC Methods: The seroprevalence of CMV antibodies was tested using CMV IgG/IgM Chemiluminescence's by Immulite 2000 system. and Enzyme linked sorbent immune assay -ELISA Results: Of the 2000voluntary blood donors screened for CMV, 1800 were positive and 200 were negative for IgG antibodies, with CMV positive prevalence rate of 90%. All of the IgG positive blood donors were negative for CMV IgM antibodies. About 96% of the donors aged between 30 to 39 years were seropositive for CMV, as against 91.9% in those aged 20-29 years, 88.6% in 40 to 49 years, 75.0% (3 out of 4) in 50 to 59 years, and 100% (1 out 1) in 60-69 years. There was no statistically significant difference (P>0.05) in the CMV IgG status in different age groups. The highest rate was found in adult male blood donors units (1800 out of 2000), making sex comparisons statistically undesirable.Conclusion: 90% of blood donors at KHMC were CMV IgG seropositive, it is advisable to screen blood donors in Jordan for CMV to identify the CMV-seronegative blood donors, and maintain an inventory of them for use as donors. We conclude that CMV IgG titer in blood units is high with possibly subsequent transmission of infection but a single serum titer is of limited diagnostic value in determining active disease.

1.Introduction:

Cytomegalovirus (CMV) is a human DNA of 150-200 nm herpes-viruses the species is known as Human Herpes virus 5 (HHV-5). The name means "big cell virus, it is a latent or dormant and slow replication virus and the potential for reactivation exists especially in immunocopromised people (1) ". CMV is one the most frequently reported cause of post-transfusion in actions in developing countries (2) Roughly more than 50% of blood donors are infected with CMV which limits the availability of CMV negative blood (3) CMV-Seronegative blood should be given to birth weight infants, pregnant women, and Seronegative recipients of CMV seronegative bone marrow or organ transplant because CMV Infection has been implicated as a cause of early graft rejection (4). Congenital infections can result in the classic CMV infection disease (CID) with symptoms characterized by cerebral calcification, hepatomegaly, splenomegaly, but later in childhood may manifest neurologic abnormalities such as mental retardation (5). Recent evidence indicates that an unusually high Incidence of CMV infection occurs among homosexuals and individuals with acquired immune deficiency syndrome (AIDS) (6). Determination of the CMV serologic status of pre-transfusion and pretransplant recipients and donors can significantly decrease the risk of the recipient contracting infection (6).

It is characterized by narrow spectrum of hosts, CMV infections remain harmless in the immunological healthy even in very early perinatal 25 % of all babies are infected during birth. The course of infection is generally asymptomatic or postnatal - infections, but can cause generalized, fatal infections in immunocompromised individuals (e.g. patients with HIV, organ transplant recipients, or neonates). CMV establishes a latent infection, frequently after an asymptomatic infection in a healthy individual

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The virus apparently persists in the latent state in mononuclear cells. Reactivation can also run an asymptomatic course, but symptoms may also develop that are generally relatively mild, such mononucleosis like clinical pictures, and mild forms of hepatitis or other febrile illnesses. Droplet infection is the most frequent route of transmission, but smear infections and nursing infections are also possible. Generalized contamination with this pathogen (over 90% of the adult population is infected) frequent reactivation with - in some cases - months of continued excretion of viruses in saliva and urine and the wide variety of potential clinical pictures are all factors that make it difficult to implicate CMV as the etiological cause of an observed illness.

The liver and lungs are the main organs involved. Retinitis is also frequent in AIDS patients. In kidney transplant patients, a CMV infection of the mesangial cells can result in rejection of the transplant. Another feared CMV-condition is an intrauterine fetal infection, which almost always result from a primary infection in the mother. The very early exposure in life to CMV infection, particularly in developing countries is associated with anti-CMV IgG in almost all exposed individuals. IgG antibodies are produced by the body several weeks after the initial CMV infection and provide protection from primary infections. Levels of IgG rise during the active infection then stabilize as the CMV infection resolves and the virus becomes inactive. After a person has been exposed to CMV, he or she will have some measurable amount of CMV IgG antibody in their blood for the rest of their life. CMV IgG antibody testing can be used, along with IgM testing, to help confirm the presence of a recent or previous CMV infection

CMV is a common virus that infects most people at some time during their lives but rarely causes obvious illness. Like other herpes viruses, CMV infection can become dormant for a while and may reactivate at a later time. The virus is carried by people and is not associated with food, water or animals Infections may be diagnosed microscopically by determination of the cytopathogen effect with characteristic elementary bodies Or Serologically by Determination of specific antibodies based on the ELISA technique

2. Materials and Methods:-

Human serum samples were collected and tested the assay is performed within 24 hours after sample collection, the specimens have been Kept at 2...8°C; otherwise they aliquoted and stored deep-frozen (-70 to -20°C).We screened 2000 Blood units from mixed gender donors ranged from 20-45 years. Between October 2010 and December 2012 at King Hussein medical center, a military teaching hospital providing health care to multinational population of mixed socioeconomic status.

The ELISA technique NovaLisaTM for Cytomegalovirus (CMV) IgG/IgM is intended for the qualitative determination of IgG-/IgM- class antibodies against Cytomegalovirus in serum or plasma (citrate).

The qualitative immunoenzymatic determination of IgG-class antibodies against CMV is based on the ELISA (Enzyme-linked mmunosorbent Assay). Micro titer strip wells are precoated with CMV antigens to bind corresponding antibodies of the specimen. After washing the wells to remove all unbound sample material horseradish peroxidase (HRP) labeled anti-human IgG conjugate is added. This conjugate binds to the captured CMV-specific antibodies. The immune complex formed by the bound conjugate is visualized by adding Tetramethylbenzidine (TMB) substrate which gives a blue reaction product.

The intensity of this product is proportional to the amount of CMV specific IgG antibodies in the specimen. Sulphuric acid is added to Stop the reaction. This produces a yellow endpoint color. Absorbance at 450 nm is read using an ELISA microwell plate reader And Chemiluminescence's by Immulite 2000 system Was applied for screening blood units for the presence of CMV-specific IgG antibody. Patient serum is reacted with the virus infected cell substrate and if antibodies to CMV are present they will bind to the antigen substrate.

3. Results

A total of 2000 Blood bank samples were screened for CMV IgG from October 2010 to December 2012 There were 1800 males and 200 females. The age range was 20-45 years. Of the 2000 screened serum samples for CMV IgG 200(10%) were negative for IgG (titer <1.1) by Immulite 2000 system and<9NTU by ELISA technique NovaLisaTM, and 1800(90%) were positive as shown in table I. 1000 males90.9%) out of 1100 aged between 20 to 30 years for CMV, as against 500 males (90.9%) out of 550 in 30 to 40 years and 100 out of 150 in 40 to 49 years were serpositive. There was no statistically significant difference (P>0.05) in the CMV IgG status in different age groups. The blood donors comprised largely of male donors (1600 out of 2000), making sex comparisons statistically undesirable. However, all the female (n=200) donors were positive for CMV IgG and negative for IgM. The statistical analysis shows no statistical significant difference, (p>0.05) CMV IgG samples Sensitivity 100% and Specificity: 98%

Table I: CMV IgG positive titer in different Age groups.

Age Years	Total No.of SERA	No(%) of sera positive for IgG	
		Male	Female
20-30	1100	1000 (90.9%)	120(60%)
30-40	550	500(90.9%)	60(30%)
40-45	150	100(66.6%)	20(10%)
Total	1800	1600	200

4. Discussion:

The results of this study showed a prevalence rate of 90% of CMV IgG in blood donors at KHMC, suggestive of past exposure to CMV infection. On the other hand, none of the donors tested positive for CMV IgM, indicating the absence of primary infection. The results of the present study of CMV IgG in the study at King Hussein Medical Center in Jordan indicate a rather comparable seroprevalence in both males and females, so gender does not seem to affect seroprevalence in the areas studied since they have an equal change .

This study is in agreement with other studies in Iraq (7), Saudi Arabia (7), and Jamaica (8) and in the United States and in Europe (9). The IgG antibody titer was higher in the age range between 20-30 years for both males and females (table 1). A single serum titer is of limited diagnostic value in determining active disease. (10)

CMV IgM by ELISA is recommended in diagnosing active disease. CMV IgG screening and measurement of avidity index (11, 12) are recommended for testing acute and convalescent sera for four fold rise in antibody titer after 1-3 weeks to determine seroconversion(13,14).

5. Conclusion

CMV-screened whole blood and blood components using a highly sensitive CMV antibody enzyme immunoassay are required for immunocompetent individuals. Since about 83% of blood donors at our hospital are seropositive for CMV, we suggest screening blood donors for CMV to identify the very few CMV-seronegative blood donors, and maintain an inventory of them for use as donors for transfusion to immunosuppressed individuals, neonates and pregnant women. Whole blood and aphaeresis donations intended should be screened for evidence of CMV infection prior to the release of blood and blood components for clinical use.

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