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Original Research Article

Seroprevalence of human cytomegalovirus among hemodialysis patients in Diayala province

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CMV, Hemodialysis, Seroprevalence, ELISA

A B S T R A C T

The aim of present study was to determining the prevalence of cytomegalovirus (CMV) antibodies in renal failure patients who undergoing hemodialysis. This study was conducted from the period 1/3/2014 to 30/10/2014 in Ibn-Sina Center for Dialysis in Diyala province. Sera of 91 hemodialysis patients were investigated for CMV-specific immunoglobulin G (IgG) using enzyme-linked immunosorbent assay (ELISA). Fifty-two (57.14%) patients were males and thirty-nine (42.85%) were females. 87 patients (95.60%) were anti-CMV IgG positive and 4 patients (4.39%) were anti-CMV IgG negative. There was no difference in CMV prevalence between males (94.2%) and females (97.4%). Seventy two patients (79%) reported history of blood transfusion. There was no relationship between the antibody titer and dialysis duration. In conclusion, we recommend that every patient who has undergone hemodialysis receive blood products free of CMV if CMV negative to reduce the incidence and prevalence of CMV among hemodialysis patients.

Introduction

Cytomegalovirus (CMV) is a member of the genus herpes virus and belongs to the family Herpesviridae. CMV is common causes of human disease and CMV infections usually asymptomatic in otherwise healthy children and adults (Hondinka, 2011).

CMV is more wide spread distribution in developing countries in areas of low socio-economic conditions, such as, lower rates of CMV infection were reported in Europe, parts of North America and Australia while higher rates were reported in Africa and Asia (Cannon *et al.,* 2010; Enders *et al.,* 2012). Distribution of CMV infection range between 40% and 90% in adults, leading to long latent infection. After the primary infection, the virus will remain in a latent state in the host life-long, but may reactivate later. Although rarely pathogenic in immunocompetent individuals, the virus causes a significant health threat to immunocompromised individuals and is a significant cause of morbidity and mortality especially in organ transplant patients (Orasch and Conen, 2012).

Human are only host for CMV. Transmission requires close person to

person contact (Abou-El-Yazed *et al.,* 2008).

Transmission of CMV infection may occur throughout life, chiefly via contact with infected secretions. Important routes of transmission included blood transfusion and solid organ transplantation (Cavlek *et al.,* 2014). CMV causes infection in immunocopromised, transplant recipients and those who receive blood transfusion frequently, such as hemodialysis (Sepehrvand *et al.,* 2010). Risk factors for primary CMV infection are blood transfusion including clotting factors, recipients of infected transplants, hemodialysis in a week (Pliquett *et al.,* 2011).

CMV can also be acquired by the infants from exposure to virus in mother's genital tract during delivery and maternal breast milk, in these cases, the infant usually have received some maternal antibody, and the parentally acquired CMV infections tend to be subclinical. Transfusion acquired CMV infections in newborns will vary depending on the amount of virus received and the serologic status of the blood donor. Whether CMV is acquired in utter or parentally, amore chronic infection results with respect to viral excretion than when the virus is acquired later in life (Cavlek *et al.,* 2011; Doan *et al.,* 2013).

Various studies demonstrated the appearance or elevation of anti-viral antibodies in hemodialysis patients. Also, CMV-related retinitis, hepatitis and pneumonitis have been reported (Sabahattin *et al.,* 2006).

Many types of assay can detect CMV IgG antibodies, indicative of past infection (the potential to undergo reactivation). Serologic are not informative for immunocompromised patients. Furthermore, serologic techniques cannot distinguish strain differences among clinical isolates (Aminzadeh *et al.,* 2005; Brooks *et al.,* 2007), therefore the aim of this study was to determining the prevalence of Cytomegalovirus (CMV) antibodies in patients who undergoing hemodialysis (HD).

Materials and Methods

The present study was conducted in Diayala province for the period from 1 / 3 / 2014 to 30 / 10 / 2014. It included; 91 patients with renal failure were attended Abn-Sina Center for dialysis. 52 of patients were males and 39 were females. The age range was 18 years to 80 years.

Collection of serum specimens

From each individual in this study, 5 ml of blood was drawn by vein puncture using disposable syringes. The blood was placed in plastic disposable tubes; it was left to stand at room temperature (20–25°C) to allow it to clot, then the sera was separated by centrifugation 10000 rpm for 5 minutes and stored at -20°C till examination. The specimens were transferred to the Virology Unit / Public Health Laboratory in Baquba for detection of CMV in serum specimens by ELISA test. All sera and reagents were allowed to stand at room temperature before use in the test.

Detection of Cytomegalovirus

Cytomegalovirus IgG (serum) ELISA test: This test was performed using commercially available kit (CMV IgG ELISA Test Kit). Reactive results were indicated by the absorbance reading of 1.1 and above, while the non-reactive results were indicated by the absorbance reading less than 0.9.

Principle test: The CMV IgG EIA Test Kit is a solid phase enzyme immunoassay based on indirect principle for the qualitative and quantitative detection of IgG antibodies to CMV in human serum or plasma. The micro well plate is coated with CMV antigen. During testing, the specimen diluents and the specimens are added to the antigen coated microwell plate and then incubated. If the specimens contain IgG antibodies to CMV, it well binds to the antigens coated on the microwell plate to form immobilized antigen-CMV IgG antibody complexes. If the specimens do not contain IgG antibodies to CMV, the complexes will not be formed. After initial incubation, the microwell plate is washed to remove unbound materials. The enzyme-conjugated anti-human IgG antibodies are added to microwell plate and then incubated. The enzyme-conjugated anti-human IgG antibodies will bind to immobilized antigen-CMV IgG antibody complexes present. After the second incubation, the microwell plate is washed to remove unbound materials. Substrate A and substrate B are added and then incubated to produce a blue color indicating the amount of CMV IgG antibodies present in the specimens. Sulfuric acid solution is added to the microwell plate to stop the reaction a color change from blue to yellow. The color intensity, which corresponds to the amount of CMV IgG antibodies present in the specimens, is measured with a microplate reader at 450/630–700 nm or 450 nm (Hondinka and Friedman, 1995).

Results and Discussion

The mean age of the patients group was 54 ± 16.3 years. Only 4 patients (4.39 %) were seronegative for CMV and 87 patients (95.60 %) were seropositive for CMV, also this study show most of hemodialysis patients was 39–69 years old (56 subjects, 61.53%) and majority of them positive for CMV (Table 1).

In addition to, Table 2 shows the gender distribution of the HD patients was 52 (57.14%) among males and 39 (42.85%) among females. Majority of patients (76.92%) were undergoing HD < 5 years and (23%) for more than 5 years. According to duration of hemodialysis (94.28%) and (100%) respectively were positive of CMV, moreover the majority of HD patients reported history of blood transfusion (79%) (Table 3).

Cytomegalovirus is one of the most frequently encountered opportunistic viral pathogen in immunocompromised individuals, including patients with renal failure undergoing hemodialysis (Cavdar *et al.*, 2008). Generally CMV infection is not recognized in such patients because these critically ill patients are not routinely monitored for CMV infection. This study was designed to determine the prevalence of cytomegalovirus (CMV) antibodies in patients undergoing hemdialysis.

This study was included 91 patients undergoing hemodialysis with their mean age is 54 ± 16.3 years, also a high prevalence of anti-CMV IgG was noticed among 87 HD patients (95.60%), additionally, the results of this study agreed with Cavlek *et al.* (2014) who reported a significantly higher CMV seropositivity among hemodialysis patients(91%). Furthermore Abou- El-Yazed *et al.* (2008) has found that seroprevalance of CMV infection among HD patients was (98%) using CMV ELISA IgG, as well as, Cannon *et al.* (2010) and Sepehrvand *et al.* (2010) recorded a high percentage of CMV IgG positivity in both gender (male and female), these results agreement with result of present study.

According to age, the 54 positive patients were located within fourth and fifth decade, with a percentage of (61.53%), besides the

mean age of patients was 54±16.3 year. This is in accordance with Sepehrvand *et al.* (2010) who stated that the mean age of patients with CMV was 56±16.18 years.

In their study also show, there was no relationship between ages, sex, dialysis duration and the antibody titer of CMV in our study. These results are similarly to study was done by Sepehrvand *et al.* (2010). In present study 72 patients (79%) reported history of blood transfusion. Our results are comparable to study by Abou- El-Yazed *et al.* (2008) from Egypt (78%) of patients had history of blood transfusion. Moreover the study by Eivazi-Ziae *et al.* (2013) demonstrated the anti-CMV seropositivity is high in Iran and blood transfusion is an important route of CMV spread. As mentioned, blood transfusion is one of major routes of CMV transmission. Since determination of CMV antibodies is not a part of the routine laboratory tests in blood transfusion centers and would just add up to screening cost yet and a high seroprevalence of CMV among general population could easily result in transmission (Mutlu *et al.,* 2008; Souza *et al.,* 2010), although CMV is not an important microorganism in immune competent persons, it is a serious pathogen in immune suppressed people, like HD patients, The finding of the present study support that patients with chronic renal failure have a risk of CMV infection.

In conclusion, the results of the present study confirm a high prevalence of CMV infection among HD patients in Diayala province. This is because patients receiving HD treatment can be exposed to CMV infection. We recommend that HD patients who are susceptible to CMV infection should be identified with anti-CMV IgG specific serological tests.

Table.1 CMV infection among the different age groups of hemodialysis patients

Age groups(years)	Suspected patients		CMV negative	CMV positive
	Number	%		
≤ 38 years	14	15.38	2	12
39 – 69 years	56	61.53	2	54
≥ 70 years	21	23.07	-	21
Total	91	100	4	87

Table.2 Distribution of infected HD patients according to gender

Sex	Suspected HD Patients		CMV positive
	Number	%	
Male	52	57.14	49 (94.2%)
Female	39	42.85	38 (97.4%)
Total	91	100	87 (95.6%)

Table.3 Distribution of the studied HD patients by their characteristics

Characteristics	Number	%
Duration of dialysis in years		
< 5 years	70	76.925%
≥ 5 years	21	23%
History of blood transfution		
No	19	21%
Yes	72	79%

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