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SEROPREVALENCE OF CYTOMEGALOVIRUS ANTIBODIES AMONG HEMODIALYSIS PATIENTS IN GEZIRA STATE, CENTRAL SUDAN

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ABSTRACT

Objective: To investigate the seroprevalence of Cytomegalovirus (CMV) antibodies among hemodialysis (HD) patients in Gezira State, Central Sudan. **Design and Methods:** Across sectional study was conducted at Gezira Hospital for Renal Diseases and Surgery (GHRDS) in 93 hemodialysis patients. Indirect Enzyme-linked immunosorbent assay (ELISA) was used to investigate anti-CMV IgM and IgG. Structured questionnaire was used to gather socio-demographic data. **Results**: In hemodialysis patients, the positivity for anti-CMV IgM and anti-CMV IgG were found in 45.2% (42/93) and 95.7% (89/93) respectively. The number of hemodialysis patients subjected to blood transfusion and previous surgery were 79 (84.9%) and 42 (45.2%) respectively. The percentage of anti-CMV IgM and anti-CMV IgG were 45.6% and 97.5%; 47.6% and92.9% amonghemodialysis patients received blood transfusions and subjected to previous surgery respectively. **Conclusions**: The prevalence of CMV infection among hemodialysis patients in Gezira state appears high. Blood transfusion was found to play a major risk factor predisposing to CMV infection.

KEYWORDS: Cytomegalovirus, Antibodies, Hemodialysis, Sudan.

INTRODUCTION

Cytomegaloviruses are ubiquitous herpesviruses that are common causes of human disease. [1] It is a genus of Herpes viruses in humans the species is known as Human Herpesvirus 5 (HHV-5). It belongs to the betaherpesvirinae subfamily of herpesviridae,[2] Complete CMV particles have a diameter of 120-200 nm. They consist of a 235-kb double stranded linear DNA genome enclosed within an icosahedral capsid, surrounded by a phospholipids' rich envelope ,[3] It is a ubiquitous virus, the seroprevalence of which varies between 30 to 100 % in different countries,[4] Transmission of the virus can occur vertically or horizontally via direct contact with infectious body fluids or blood. The virus can also be transmitted by blood products or transplanted organs. The clinical features of CMV include malaise, myalgia, fever, liver function abnormalities, lymphocytosis and mild hepatitis. More rare features include anaemia, thrombocytopaenia, and meningoencephalitis,[5,6] Diagnosis of HCMV is based on clinical symptoms, however, the symptoms of HCMV are confused with Epstein-Barr virus (EBV), and this may lead to difficulties in diagnosis. Laboratory confirmation is achieved serologically by Enzyme Linked Immunosorbent Assay (ELISA). Four drugs ganciclovir/valganciclovir, cidofovir, foscarnet and fomivirsen have been approved for the treatment of CMV diseases,[7] This study was designed to determine the seroprevalence of CMV antibodies in renal failure patients undergoing hemodialysis.

MATERIALS AND METHODS

This was a cross-sectional study conducted in, Gezira state, Central Sudan between of March 2013 and June 2013. A total of 93 blood samples were collected from haemodialysis (HD) patients at Gezira Hospital for Renal Diseases and Surgery (GHRDS). The investigated patients included 48 (51.6%) male with mean age (43.1±14.9) and 45 (48.4%) female with mean age (43.4±18). The patients were informed for the purpose of the study before collection of the specimens, and verbal consent was taken. Demographic data was obtained by direct interviewing questionnaire from patients. Age of patients range between21 and 50 years of age and stratified in the following age groups: < 21 years, 21-30, 31-40, 41-50, and >50 years old. The collected data included, age, gender, date and place of sample collection.

Blood samples (5ml), were collected in sterile EDTA containers, then centrifuged at 4000 rpm for 5 minutes to obtain the plasma. The plasma was taken immediately and stored at -20 ˚C for later analysis. The enzyme-linked immunosorbent assay (ELISA) (GENESIS Diagnostic, Omega, UK) was used to test for the presence of specific HCMV IgG and IgM antibodies as described by the manufactures.

The percentages of positive and negative results were for each age group and sex. Obtained data were analyzed using the statistical package (SPSS) and the significance of difference was determined using chi-square test. Statistical significance was set at P values < 0.05. Ethical approval was obtained from the research ethical committee of the Omdurman Islamic University, Sudan.

RESULTS

When the 93 plasma specimens from hemodialysis patients were examined by direct ELISA, 42 (45.2%) were positive for anti-CMV IgM, while 89 (95.7%) were positive for anti-CMV IgG **(Figure 1 & 2)**.

As shown in **(Table 1)**, there was no significant difference (P>0.05) on the prevalence of anti-CMV among genders, although, the anti-CMV IgG is found high among males. The seroprevalence of both anti-CMV IgM and anti-CMV IgG were decreased with increasing age, however the highest (100%) prevalence for anti-CMV IgG was found in the age groups less that 20 and up to 40 years, while the highest (80%) prevalence for anti-CMV IgM was found to be in the age group between 21-30 years**(Table 1)**.

The results in **table (2)** showed the contribution of blood transfusion and previous surgery to CMV infection. Among all the hemodialysis patients, 84.9% (79/93) were undertaken blood transfusion. The anti-CMV IgM was demonstrated in 45.6% (36/79) and the anti-CMV IgG was detected in 97.5% (77/79) in hemodialysis patients receiving blood transfusion Whereas,45.2% (42/93) of the study subjects were subjected to previous surgery, in which anti-CMV IgM was detected in 47.6% (20/42) and anti-CMV IgG was detected 92.9% (39/42), their results reported. Compared to previous surgery, blood transfusion seems to play a major risk factor predisposing to CMV infection in our study result (p<0.05).

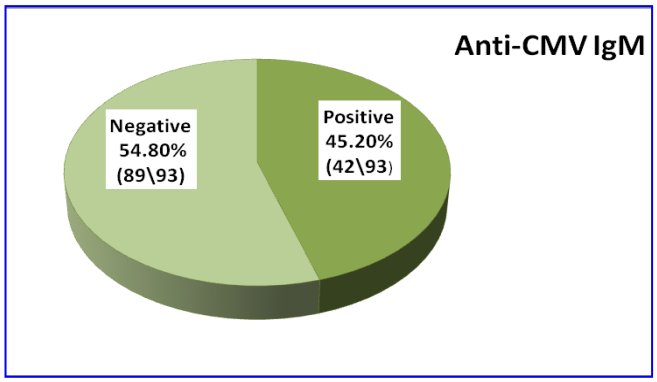

Figure (1): Detection of anti-CMV IgM in plasma specimens collected from hemodialysis patients by direct ELISA.

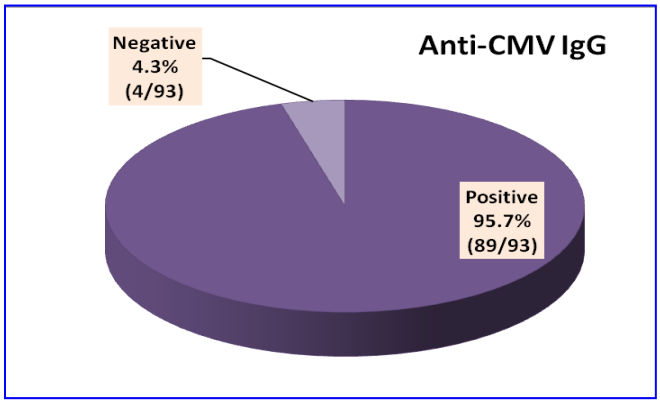

Figure (2): Detection of anti-CMV IgG in plasma specimens collected from hemodialysis patients by direct ELISA

Table(1): The effect of gender on seroprevalence anti-CMV IgM and IgG in hemodialysis patients.

Type of Anti-CMV		Gender		Total (%)	Age group years (%)				
		Male (%)	Female (%)		<20	21-30	31-40	41-50	>50
IgM	Positive	21 (43.7)	21 (46.7)	42 (45.2)	4 (44.4)	9 (60.0)	10 (55.6)	8 (38.1)	11 (36.7)
	Negative	27 (56.2)	24 (53.3)	51 (54.8)	5 (55.6)	6 (40.0)	8 (44.4)	13 (61.9)	19 (63.3)
IgG	Positive	47 (97.9)	42 (93.3)	89 (95.7)	9 (100)	15 (100)	18 (100)	20 (95.2)	27 (90.0)
	Negative	1 (2.1)	3 (6.7)	4 (4.3)	0	0	0	21 (4.8)	3 (10.0)

Table(2): The effect of Blood transfusion and previous Surgery on seroprevalence of anti-CMV IgM and IgG among hemodialysis patients.

Type of Anti-CMV		Blood Transfusion		Total	Previous Surgery		Total
		Yes(%)	No(%)		Yes(%)	No(%)	
IgM	Positive	36 (45.6)	6 (42.9)	42 (45.2)	20 (47.6)	22 (43.1)	42 (45.2)
	Negative	43 (54.4)	8 (57.1)	51 (54.8)	22 (52.4)	29 (56.9)	51 (54.8)
IgG	Positive	77 (97.5)	12 (85.7)	89 (95.7)	39 (92.8)	50 (98.0)	89 (95.7)
	Negative	2 (2.5)	2 (14.3)	4 (4.3)	3 (7.2)	1 (2.0)	4 (4.3)

DISCUSSION

Hemodialysis is life line of renal failure patients to keep their life, but the risk of acquisition of blood borne viral infections is possible.[1] This study was designed to determine the seroprevalence of CMV antibodies in renal failure patients undergoing hemodialysis. In this study, the seroprevalence of anti-CMV IgM was detected in 42 (45.2%) and anti-CMV IgG was detected in 89 (95.7%) of the total 93 plasma specimens collected from hemodialysis patients. Our aforementioned results for anti-CMV IgM are similarly high to our local study by Awadelkareem et al., (6.0%) and Abdullah (0.0%) in Khartoum State, Sudan,[8,9] and to other studies done in Iran (7.1%&18.5 %),[10, 11] and in Turkey (3.3%). [12] The percentage of anti-CMV IgG is in agreement with results obtained by the local studies in Sudan (98.12% & 95.0%),[8,9] in Iran (91.0%& 93.0),[10,11] and in Turkey (99.6%),[13] and found high than those results reportedin Prague (80%),[14] in Ghana (77.6%),[15] in Turkey (67%),[16] and in Egypt (36.2%).[17] The difference in the percentage of anti-CMV IgM and IgG in this study compared with other studies may be attributed to several factors including endemicity of infection, study population and the diagnostic techniques used. It has been stated that incidence rate of the CMV infection in different environments is varying geographically, [18] and the widespread of cytomegalovirus infection is more likely in developing countries and in areas of low socioeconomic conditions,[19,20] Also blood transfusion and machine of the hemodialysis are representing predisposing factor to CMV infection[18] The Seroprevalence of CMV antibodies among age groups was found to be decreased with increasing age which is not agree with an in country study reported the serodetection of cytomegalovirus was increased with increasing age[9] In agreement with other study[18] we found that the percentage of CMV antibodies particularly for anti-CMV IgG was found high among study patients subjected to blood transfusion and previous surgery. This finding supports the idea that to decrease the incidence of transfusion-associated CMV infection, only blood products negative for CMV antibodies should be used in blood transfusion, and this idea was proposed as a future strategy to conduct routine screening of donor blood for CMV antibodies.[21]

CONCLUSION

Our study was conducted in one of the biggest state in Sudan, this state represents the core of the Sudanese population, as well as, it is an irrigative area in which the diversity of ethnicity and low socioeconomic status reflect the real situation in such similar studies. Our results taken together with the findings of **Abdullah,**[8] and **Awadelkareem,**[9] it is obvious that

CMV is endemic in Sudan, and this perhaps could be related to socioeconomic status, environmental, and climate factors.

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