

Serodetection of Human Cytomegalo Virus among Cancer Patient in Oncology Hospitals in Khartoum State, Sudan

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Abstract

Background: Cytomegalovirus (CMV) is a large encapsulated double-stranded DNA virus belonging to the family Herpesvirida subfamily beta herpes viral.

Objectives: To investigate the prevalence of the human cytomegalovirus in cancer patients.

Result: A total 100 patients. Blood samples were tested for IgM and IgG antibodies using ELISA according to gender (Male 27% positive CMV IgM 73% Negative CMV IgM, 45% positive CMV IgG 55% Negative IgG) Female 7% positive CMV type o IgM 93% Negative CMV IgM ,59% positive CMV IgG 41%Negative CMV IgG. In Breast cancer patient 1% positive CMV IgM and 9 % Negative, 5% positive CMV IgG 5% Negative IgG. In prostatic cancer 4% positive CMV IgM and 3% Negative CMV IgM, 4% positive CMV IgG 3% Negative CMV IgG. In CML 9% positive CMV IgM 38% Negative CMV IgM 22% positive CMV IgG 25% Negative CMV IgG. In AML 8%positive CMV IgM 28% Negative CMV IgM 18% positive CMV IgG 18% Negative CMV IgG. According to chemotherapy 18% positive CMV IgM 58% Negative CMV IgM 36% positive CMV IgG 40% Negative CMV IgG. And according to history Blood transfusion 19%positive CMV IgM 17%Negative CMV IgM 25% positive CMV IgG 11% Negative CMV IgG while in patients with no history of blood transfusion 3% positive CMV IgM 61% Negative CMV IgM 24% positive CMV IgG 40% Negative CMV IgG.

Conclusion: According to the result of this study and the results reported by the previous studies in Sudan among the blood donors and other target groups (Haemodialysis, Organ transplant patients, and pregnant women) prove that the Cytomegalo virus was highly distributed among Cancer patients in Sudan.

Keywords: Cytomegalovirus; cancer; IgG; IgM; Blood samples; ELISA

Introduction

CMV is a large encapsulated double-stranded DNA virus that belongs to the Herpesviridas subfamily beta herpesviral family [1]. In addition to intrauterine infection of the baby during pregnancy, blood transfusion during donation, and organ transplantation, CMV infection can be spread through contact with bodily secretions such as saliva, breast milk, vaginal secretion, and semen, urines, and tears. Antibodies to the virus are present in the majority of people, indicating that the infection is widespread and prevalent [2]. CMV infection is asymptomatic in 10% to 15% of newborns at birth and can have long-term consequences, including sensor neuronal hearing loss, months or years later [3]. In many individuals, CMV infection is asymptomatic; nevertheless, symptoms such as fever;

malaise, hepatosplenomegaly, and rash may appear [4]. CMV infection in newborns can cause intrauterine infection, mental defects, and even stillbirth; in adults, it can cause infectious mononucleosis [5]. Congenital CMV infection in low birth weight (LBW) neonates, immune-compromised patients (HIV and Leukemia patients), solid organ or hematopoietic stem cell transplants is linked to a high rate of morbidity and mortality, as well as hepatitis, retinitis, and multisystem failure [6]. The risk of contracting CMV via a blood transfusion is roughly 1 to 5% per unit of whole blood [7]. Immunocompromised patients, such as pregnant women and neonates with AIDS, as well as those who are receiving chemotherapy or other immunosuppressive therapy, are all at risk of acquiring substantial CMV morbidity. CMV infection or reactivation can cause major consequences and even death in these people [8]. The function of viruses in breast carcinogenesis has received a lot of research during the last few decades. Human papillomaviruses (HPVs), Epstein–Barr virus (EBV), mouse mammary tumor virus (MMTV), bovine leukemia virus (BLV), and human cytomegalovirus (HCMV) have all been linked to breast cancer [9].

Materials and Methods

This was a descriptive cross-sectional study, was conducted in Khartoum oncology hospital in Sudan 2021. Khartoum oncology hospital is the first center in Sudan for the treatment of tumors, specializing in the diagnosis and treatment of tumors, thyroid diseases and various blood cancers.

This study included 100 cancer patients ages ranging from 1 and 70 years old. With a mean of 35.7. The data was gathered via a self-administered questionnaire. covers demographic questions, cancer types, chemotherapy history, blood transfusion history, and CMV IgG and IgM findings. Furthermore, blood samples were collected under aseptic conditions and ELISA was used to test for IgM and IgG antibodies. An Enzyme Linked Immunosorbent Assay (ELISA) is a biochemical technique commonly used in immunology to detect the presence of an antibody or antigen in a sample. It is an effective method for detecting and measuring biological substances such proteins, peptides, antibodies, and hormones. ELISA can provide a quick and meaningful measurement of the quantity of an unknown antigen or antibody by combining the specificity of antibodies with the sensitivity of a simple enzyme assay. A chi-square test was performed to examine the relationship between categorical data, and a p-value of less than 0.05 was considered significant.

Result

There were 100 patients in total. The gender (male: 27 percent positive CMV IgM, 73 percent negative CMV IgM, female: 45 percent positive CMV IgG, 55 percent negative IgG) Only 7% of females were positive. CMV IgM Negative CMV IgM in 93% of cases, positive CMV IgG in 59% of cases, and negative CMV IgG in 41% of cases. In terms of cancer type, just 1% of those with breast cancer had positive CMV IgM, whereas 9 percent had negative CMV IgM. Positive CMV IgM accounts for 5% of the total, while negative CMV IgM accounts for 5% of the total. CMV IgG Negative IgG at 5% Cancer of the Prostate 4% of people are optimistic. CMV IgM positivity is 3 percent in the negative group and 4 percent in the positive group. CMV IgG was negative in 3 percent of cases, CML was positive in 9 percent of cases, and CMV IgM was positive in 38% of cases. Positive CMV IgM is 22 percent of the time.

<i>Demography</i>	<i>Frequency</i>	<i>Percentage</i>
<i>Gender</i>		
Male	73	73%
Female	27	27%
<i>Age</i>	1-70(35.70±37.50)	
Below 40	58	58%
Above 40	42	42%

Types of cancers		
Breast Cancer	10	10%
Prostatic cancer	7	7%
CML	47	47%
AML	36	36%
History of chemotherapy		
Yes	76	76%
No	24	24%
CMV IgM		
Positive	22	22.0
Negative	78	78.0
CMV IgG		
Positive	49	49.0
Negative	51	51.0

Table 1: Demographic data, Type of cancer, History of chemotherapy and ELISA result of patients with cancer in Khartoum oncology hospitals in Khartoum state 2021.

CMV IgM		Age groups	Duration of cancer
Positive	Mean	4.41	5.82
	N	22	22
	Std. Deviation	1.919	4.008
Negative	Mean	3.94	5.38
	N	78	77
	Std. Deviation	1.923	3.297
Total	Mean	4.04	5.47
	N	100	99
	Std. Deviation	1.922	3.450
<i>P. Value</i>		<i>0.310</i>	<i>0.599</i>

CMV IgM		Age groups	Duration of cancer
Positive	Mean	4.08	5.33
	N	49	49
	Std. Deviation	1.847	3.590
Negative	Mean	4.00	5.62
	N	51	50
	Std. Deviation	2.010	3.337
Total	Mean	4.04	5.47
	N	100	99
	Std. Deviation	1.922	3.450
<i>P. Value</i>		<i>0.833</i>	<i>0.674</i>

Table 2: Correlation between patients' age and duration of cancer of patients with cancer in Khartoum oncology hospitals in Khartoum state 2021.

Variable	CMV IgM			P value	
		Positive	Negative		Total
Gender	Female	2	25	27	0.032
	Male	20	53	73	
	Total	22	78	100	
Types of cancer	Breast Cancer	1	9	10	0.107
	Prostatic cancer	4	3	7	
	CML	9	38	47	
	AML	8	28	36	
	Total	22	78	100	
chemotherapy	Yes	18	58	76	0.469
	No	4	20	24	
	Total	22	78	100	
Blood transfusion	Yes	19	17	36	0.00
	No	3	61	64	
	Total	22	78	100	

Table 3: Association between CMV IgM and Gender, Types of cancer, chemotherapy and Blood transfusion of patients with cancer in Khartoum oncology hospitals in Khartoum state 2021.

Variable	CMV IgG			P value	
		Positive	Negative		Total
Gender	Female	16	11	27	0.212
	Male	33	40	73	
	Total	49	51	100	
Types of cancer	Breast Cancer	5	5	10	0.961
	Prostatic cancer	4	3	7	
	CML	22	25	47	
	AML	18	18	36	
	Total	49	51	100	
chemotherapy	Yes	36	40	76	0.561
	No	13	11	24	
	Total	49	51	100	
Blood transfusion	Yes	25	11	36	0.002
	No	24	40	64	
	Total	49	51	100	

Table 4: Association between CMG IgG and Gender, Types of cancer, chemotherapy and Blood transfusion of patients with cancer in Khartoum oncology hospitals in Khartoum state 2021.

Discussion

Cytomegalovirus (HCMV) is a frequent viral infection that changes one's immune system for the rest of one's life. A history of HCMV infection has been linked to a variety of chronic illnesses, including cancer. Furthermore, prospective cohort studies have shown that HCMV is linked to all-cause mortality. This study aimed at investigating the seroprevalence of HCMV among cancer patients, a total of one hundred of patients with different types of cancer were recruited.

This study found no significant relationship between patients' age, cancer duration, and CMV IgM and IgG ($p > 0.05$). This was in contrast to the findings of Yang et al [9]. They discovered that HCMV seropositivity was positively associated to age, BMI, and menopause. In contrast, the prevalence of CMV IgM in males was 20% (20/100) greater than in females 2% (2/100), with a significant p value ($p=0.032$). We differ with the findings of Benedetto et al [10], who found that 52 (32.3 percent) of females and 50 (31.0 percent) of males were CMV-positive. Sara et al [11] concurred with our findings, indicating that male participants had considerably more detectable CMV replication than females (Fisher $P < 0.01$) and disagreeing with Benedetto et al [10]. However, Lachmann et al [12] concurred with our findings, finding that overall CMV seroprevalence was 56.7 percent (95 percent CI: 54.8–58.7 percent), with women having a greater seroprevalence (62.3 percent) than men (51.0 percent).

Furthermore, CMV IgM was found in 9 percent (9/100) of CML patients, followed by 8 percent (8/100) of AML patients ($p = 0.1$). Furthermore, CMV IgM was prevalent in patients undergoing chemotherapy ($p=0.4$). CMV IgM was found in 19% (19/100) of patients who had a history of blood transfusions, with a significant p-value (0.00). Silva et al [13] disagreed with our findings, claiming that the relationship between transfusion and prevalence rates was not statistically significant ($p = 0.36$).

In terms of CMV IgG, it was found in 33% of males (33/100) versus 16% of females (16/100), with no significant correlation ($p=0.2$). Furthermore, those with CML showed a higher prevalence of CMV IgG 22 percent (22/100), followed by those with AML 18 percent (18/100) in comparison to other types of cancer ($p=0.9$). Furthermore, CMV IgG was found in 36% of individuals who had chemotherapy (36/100), with no significant p-value. Furthermore, 25 percent (25/100) of patients with a history of blood transfusion had a high frequency of CMV IgG with a significant relationship ($p=0.002$). Dafalla et al [14] concurred with our findings, indicating that the prevalence of cytomegalovirus (CMV) according to the type of leukemia was high in the case of chronic myeloid leukemia CML. There were 42 (60%) IgG positive patients and 6 (8.5%) IgM positive patients, with no significant difference across forms of leukemia.

Conclusion

According to the result of this study and the results reported by the previous studies in Sudan among the blood donors and other target groups (Haemodialysis, Organ transplant patients, and pregnant women) it is highly suggested that HCMV is not only common but highly endemic in Sudan.

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