



PREVALENCE OF CYTOMEGALOVIRUS ANTIBODIES AND CD4 LEVEL AMONG HIV/AIDS PATIENTS ATTENDING SPECIALIST HOSPITAL, SOKOTO, NIGERIA

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ABSTRACT

Background: Cytomegalovirus (CMV) is member is a member of the family Herpesviridae. It establishes latent state following primary infection, reactivating when there are changes in immune status. It is a virus of paradoxes and can be a potential killer or a silent lifelong companion. CMV infection is a common opportunistic viral infection among HIV/AIDS patients.

Aim: This study therefore aimed at Studying “Prevalence of Cytomegalovirus (IgG, IgM) antibodies and CD4 level among HIV Positive Patients Attending Specialist Hospital, Sokoto.

Methodology: A total of 90 HIV patients and 30 healthy individuals were enrolled. Blood was collected and the samples were screened serologically for IgG, IgM, IgG/IgM antibodies and CD4 levels were estimated.

Results: The results showed that out of 90 HIV patients, 15(16.6%) were IgG reactive, 6(7.1%) IgM reactive and 5(5.88%) were IgG/IgM reactive. For the Controls out of 30, 3(10%) IgG positive, 3(10%) IgM and 2 (6.6%) IgG/IgM positive with $p=0.358, 0.689, 0.824$ respectively. This shows that there no statistically significant difference between CMV infection in HIV patients and Healthy individuals. The CD4 level was estimated for test and control, Mean 514.92 ± 202.36 and 997.84 ± 145 respectively. P value is 0.000 which shows that there is statistically significant difference between CD4 level in the test and control. Similarly, the association between CD4 level and CMV antibodies (IgG, IgM and IgG/IgM) was obtained using Chi square and the p values were 0.057, 0.968 and 0.464. This indicated that there is no statistically significant association between CD4 level and CMV infections.

Conclusion: Although, the study indicated that CMV infection among HIV positive cases is statistically not significant, but the case study reveals the need of further investigation to highlight the severity of the problem. It will help in better management of the HIV cases with early diagnosis of CMV antibodies in the patients.

Key words: Cytomegalovirus, IgG, IgM, CD4 level, HIV patients,

INTRODUCTION

The human immunodeficiency virus (HIV) is a retrovirus that infects cells of the immune system, destroying their function (Cheesbrough, 2005): Sub-Saharan Africa continues to bear disproportionate share of the global HIV burden. In mid-2010, about 68% of all people living with HIV resided in

sub-Saharan Africa, a region with only 12% of the global populations (UNAIDS: 2011). It was estimated that 3.5million in Nigeria in 2012, making Nigeria third among countries with the highest burden of HIV infection in the world after India and South Africa (NARHS Plus II, 2012).

Prevalence of Cytomegalovirus Antibodies

The Human Immunodeficiency Virus (HIV) is the virus that causes Acquired Immune Deficiency Syndrome (AIDS) and was first recognised internationally in 1981, and has since claimed over 25 million lives worldwide. The 2008 HIV sentinel survey shows that Sokoto state, the study area had a relatively low prevalence of 6.0% when compared with the other states in Nigeria, but it was still above the national average of 4.6% (ICF, 2019; NPC, 2019). Contrary to the situation in the other states in Nigeria where the prevalence of HIV was higher in urban than rural areas, Sokoto and the neighbouring Kebbi state recorded a higher prevalence of HIV in rural areas compared to urban areas (NPC, 2019). In Sokoto state the rural prevalence of HIV was 10.1% while the urban prevalence was 3.9% (ICF Macro, 2019; National Population Commission (NPC), 2019).

AIDS is defined in terms of how much deterioration of the immune system has taken place as evident by the presence of opportunistic infections like pneumonia and tuberculosis (NAIDS/STICP:2001). Human Immunodeficiency Virus (HIV) causes progressive impairment of the body's cellular immune system leading to increased susceptibility to infections and tumours, and a fatal condition known as Acquired Immunodeficiency Syndrome (AIDS) (Cheesbrough, 2005). HIV infects cells bearing the CD4 antigen receptor, the most important being T – helper lymphocyte (CD4 T = cells). These cells regulate cellular and humeral immunity by interacting with other T lymphocytes, B – lymphocytes, macrophages and natural killer cells. When CD+4 positive T – cells are depleted, immune defences are weakened (Cheesbrough, 2005). T- Lymphocytes modulate production or secretion of antibodies by B – lymphocytes. As the infection progresses, it attacks or binds the CD4+receptors of T-Helper cells and penetrates, replicates and produces progeny virus (Cheesbrough, 2005). These immune

systems function as a defence mechanism against certain malignant cells in the body. These are the white cells in the blood, the lymphocytes which consistently patrol the body from their normal place of abode, the lymphoid organs, where they are produced (Turmer and Unai, 2000). These are the T-lymphocytes (T-cells) and B-lymphocytes (B-cells) which have different actions. Most of the T-lymphocytes, the T4 lymphocytes act as coordinator of the defence operations and consequently play a very important role in regulating immune functions. Hence the AIDS virus targets mainly these T-cells or T-Helpers and destroys them eventually, resulting to AIDS due to reduction in the number of T4 lymphocytes and the T-Helper cells (Tumer and Unai, 2000).

Cytomegalovirus (CMV) is a widely distributed opportunistic agent seen with AIDS (Akinbami *et al.*, 2010). It is a beta – herpes virus; the major cause of non – Epstein – Barr virus infectious mononucleosis in the general population and an important pathogen in immune-compromised hosts, including patients with AIDS, 'neonates and the transplant recipients (Krech, 1973). In most people with a fully functional immune system, the initial infection with CMV may cause a mild flu like illness and later the virus remains dormant. A damaged immune system permits the reactivation of CMV. A synergistic effect may worsen the progression in HIV infected persons (Chakravarti *et al.*, 2009). Cytomegalovirus (CMV) is ubiquitous herpes virus that generally causes asymptomatic or mildly symptomatic infections in immune competent hosts. In contrast, the CMV infection immuno compromised patients' carry high morbidity and mortality (Springer and Weinberg, 2004). All herpes viruses share a characteristics ability to remain latent within the body over a long period (Ryan and Ray, 2004). It is probably one of the most common latent infections known to humans (Chakravarti *et al.*, 2009).

Autopsy and clinical studies indicate that 90% of patients with AIDS develop active CMV infection during their illness, with life or sight-threatening complication in about 25% attributable to direct effect of the virus (Drew,1989) Cytomegalovirus is mainly a problem for certain high risk groups which include unborn babies whose mothers become infected with CMV during pregnancy and children or adults whose immune systems have been weakened by disease or drug treatment such as organ transplant recipients or people infected with HIV(Schleiss, 2010).

Both symptomatic and asymptomatic CMV infections are associated with an increased risk of death in the AIDS patients this might be due to organ failure which is related to the CMV end organ disease (Spector *et al.*, 1998).

MATERIALS AND METHODS

Study Area

The study area selected for this research is Sokoto metropolis, Sokoto State north western Nigeria .It shares borders with Niger Republic to the North, Kebbi State to South West and Zamfara State to the East (SSBD, 2007). The city lies between longitude 05° and 42'' to 22'' East and latitude 12° 15 to 29'' North and covers an area of 60.33Km (SSBD, 2007). The indigenous inhabitants of the study area are mainly Hausa and Fulani. Other ethnic groups' residents in the area include Igbo, Yoruba, Nupe, Ibirra, Igala.

Study Population

In this study, the HIV patients attending HIV clinic Specialist Hospital, Sokoto were recruited and enrolled for the research.

Sample Collection

Two ml of whole blood was collected from each HIV infected patient by venepuncture into Plain vacutainer tube and stored at 2°-8°C

Laboratory Test Method

The test was carried out using CMV IgG/IgM Rapid Test, which is a lateral flow immunoassay for the simultaneous detection and differentiation of IgM and IgG Cytomegalovirus (CMV) in human plasma. It was intended to be used as a screening test and as an aid in the diagnosis of infection with CMV.

CD4 ESTIMATION

Flow cytometry

The CD4+ T cells were enumerated using flow cytometry method as described by (Cassens *et al.*, 2004)

Statistical Analysis

The data collected was analysed using statistical package for social sciences (SPSS) version 20. Chi-square test was used to determine associations between seroprevalence and CD4 level.

RESULTS

The prevalence of cytomegalovirus (IgG, IgM and IgG/IgM) antibodies and CD4 level among HIV patients attending the HIV Clinic Specialist Hospital Sokoto, socio demographic characteristics of the study population was obtained as shown in the table 1. This study shows that out of 90 HIV patients 15(16.6%) are CMV IgG reactive, 6(7.1%) IgM reactive and 5(5.88%) are IgG/IgM reactive and 30 healthy individuals were recruited and the results as shown in table 3.The chi square analysis shows that there was no statistically significant difference between CMV infection in HIV individuals and healthy individual ($P>0.005$).The CD4 level among HIV and normal individual was shown in table 4.3 with Mean 514.94 ± 202.36 and 997.84 ± 145.024 . A t- test showed ($P<0.000$). This shows that there is statistically significant difference between CD4 level in test and Control. The study shows in table 3, and 4 that there is no statistically significant relationship between CD4 level and CMV infections ($P>0.005$)

Prevalence of Cytomegalovirus Antibodies

Table 1: Demographic Characteristic of the study population Attending HIV specialist Hospital Sokoto

Characteristics	Test(90)	Control(30)
Age group		
0-9	3	0
10-19	0	0
20-29	21	24
30-39	43	5
40-49	8	1
50-59	13	0
60-69	2	0
Gender		
Male	35	18
Female	55	12
Marital Status		
Single	17	25
Married	54	5
Divorced	3	0
Widowed	16	0
Tribe		
Hausa	66	17
Fulani	9	1
Yoruba	3	6
Igbo	7	3
Others	4	3
Occupation		
Civil servant	23	4
Business	30	0
Farmer	9	0
Student	10	26
Unemployed	18	0
Educational Status		
Tertiary	24	30
Secondary	19	0
Primary	6	0
No formal	40	0

Table 2: Mean and standard deviation of the CD4 level among the HIV patient attending the Specialist Hospital.

Category	N	Mean	STD
Test	90	514.92	±202.36
Control	30	997.84	±145.02

P=0.000df=118, t = -12.6

Table 3: Relationship between the CD4 level and cytomegalovirus antibody (IgG) among the subjects

CD4 level(cells/ul)	CMV IgG		Total
	Positive	Negative	
100-399	8	18	26
400-699	3	44	47
700-999	5	27	32
1000-1299	2	15	17

$X^2 = 7.522$, **p-value=0.057**

Table 4: Relationship between the CD4 level and cytomegalovirus antibody (IgM) among the subjects

CD4level(cells/ul)	CMV IgM		Total
	Positive	Negative	
100-399	2	24	26
400-699	3	44	47
700-999	3	29	32
999-100	1	14	15

$X^2= 0.257$ $p=0.968$

DISCUSSION

In this study, a total 90 HIV positive individual (Male, female and children) attending Specialist Hospital Sokoto were recruited and enrolled in the study, their Socio demographic characteristics were obtained using administered questionnaire. Similarly, total number of 30 apparently healthy individual were recruited and enrolled as control. Out 90 HIV positive recruited 35 are males and 55 females, 18 males and 12 female for the control.

The results obtained showed that 15 out 90 which is (16.6%) are CMV IgG antibodies positive specific CMV IgM antibodies seropositivity was found to be 6(7.1%) and IgG/IgM antibodies positive was found to be 5(5.88). This prevalence is in line with the study conducted by Musa *et al.*(2014) in Infectious Diseases Hospital Kano, North western Nigeria.It is equally within the world range (0 – 10%) (Turbadkar *et al.*, 2000). The prevalence rate was in accordance with the work done by Akinbami *et al.*, (2010) in his study among immune-compromised (HIV) patients at Lagos University Teaching Hospital. It is almost similar when compared to the work of Basawaraju *et al.*, (2011) (9.52%) that carried out his study among AIDS patients in India. The prevalent rate does not correlate with those of Chakravarti *et al.*, (2009).

The relationship between the seroprevalence of cytomegalovirus IgG antibodies among HIV positive individual and control has Chi square value of 0.844 at degree of freedom of 1 has p-value of 0.358,

that of IgM has a Chi square value of 0.34, at $df =1$ has a p-value of 0.689, and the IgG/IgM has p-value of 0.824.This shows that there is no statistically significant association between the Cytomegalovirus infection in HIV patient and healthy in individuals.

On the other hand, the CD4 level among the HIV patients was obtained and that of Control subject was obtained and the mean of the HIV subject was 514.92 ± 202.36 , and that of control was 997.84 ± 145.02 . The t-test value was obtained to be -12.06 at $df=-12.06$, $p=$ value 0.000. Which indicate there is statistically significant difference between the CD4 level among the HIV patients and the controls. The association between the CD4level and cytomegalovirus infection among HIV patients was obtained using Chi square test for IgG, $\chi^2=7.522$, $df=3$ $p=0.057$, for IgM $\chi^2=0.257$, $df=3$ $p=0.968$ and for IgG/IgM $\chi^2=2.565$, $df=3$ and $p=0.464$.

This shows that there is statistically significant association between the cytomegalovirus infection and the CD4 level among the HIV patients and normal individuals. This in line with the research Carried out in Infectious disease hospital Kano state by Musa *et al.*(2014), a similar research is carried out University of Maiduguri Teaching Hospital by Denu *et al.* (2014). However, this research does not agree with the research carried out in Benue State University Makurdi, Benue State by Anigilaje *et al.* (2014), which shows higher prevalence than the previous studies.

Similarly, this type of research was carried in other part of the world like India by (Basawaraju *et al.*, 2011) shows that out of the 94 cases, IgG antibodies were detected in 84 (89.4%) and IgM antibodies in 10(10.6%) cases. Among the 84 IgG cases, there were 42 males and 42 females. The IgM antibodies were positive in 4 (9.52%) out the 42 cases of the AIDS patients and in 6(11.5%) out the 52 seropositive healthy individuals.

The Chi square test was applied and the two-tailed P value equaled to 1.0000. The association between the CD⁴ count and the IgM antibodies was considered to be statistically not significant.

CONCLUSION

The high sero-prevalence of CMV antibodies among both HIV-positive and HIV-negative individuals suggests endemicity of this infection in our environment. Sexual transmission and traditional practices plays a significant role in acquisition of CMV infections in this part of Nigeria. The present study indicates that

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CMV infection among HIV positive cases although is statistically not significant, but the case study reveals the need of further investigation from different parts of the country to highlight the severity of the problem. It will help in better management of the HIV cases with early diagnosis of CMV antibodies in the patients.

RECOMMENDATION

It is recommended in this study that:

- I. There should be Health education on preventive measures in expedient with emphasis on identification risks of acquisition of CMV infection
- II. Routine screening of HIV for CMV should be adopted in all health facilities
- III. This type of research should be carried out using ELISA technique to quantitatively measure the CMV antibodies among HIV patients
- IV. Larger study group of HIV patient should be studied to determine the more accurate results.

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