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SEROEPIDEMIOLOGICAL ANALYSIS OF PAST HUMAN CYTOMEGALOVIRUS INFECTIONS AMONG HIV-INFECTED INDIVIDUALS ATTENDING A HOSPITAL IN RIVERS STATE, NIGERIA

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ABSTRACT: The human Cytomegalovirus (HCMV) is an important opportunistic pathogen that accelerates disease progression in HIV-infected individuals globally, which contributes to a high rate of morbidity, mortality, HIV acquisition and disease progression. This qualitative cross-sectional study analysed plasma samples from 93 HIV positive subjects visiting a health institution in Rivers State, Nigeria. The study aimed to investigate the burden and associated factors of human cytomegalovirus (HCMV) co-infection among HIV-infected individuals in Rivers State. Plasma samples were screened for HCMV-specific IgG antibodies by ELISA using commercial kits. Socio-demographic characteristics of the subjects were collected using a structured questionnaire. Chi-square test was used to assess the statistical significance of different socio-demographic factors to HCMV acquisition. All 93 subjects (100%) were seropositive for HCMV IgG antibodies. No statistical association existed between the prevalence of HCMV IgG antibodies and the socio-demographic factors studied, except the educational level (p=0.147). Higher prevalence of HCMV IgG antibody was found in the age group 25-44 years, 75 (80.6%), female gender 54 (58.1%), single marital status 44 (47.3%), secondary education 31(33.3%), self-employed 51(54.8%), Christians 82 (88.2%) and ART use 92(98.9%). The high seropositivity of HCMV IgG antibody in this study is an indication that there had been a past HCMV infection among the study population, which necessitates the need for serological evaluation in all HIV-infected individuals to avoid reactivation of HCMV coinfection.

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1. INTRODUCTION

The Human Immunodeficiency Virus (HIV) is immunosuppressive. It weakens the immune system and facilitates the advancement of HIV infection to AIDS (acquired immunodeficiency syndrome) in the absence of treatment. HIV-1 remains a major health concern, particularly in West and Central Africa. When HIV is present, inflammation thrives. New research suggests that persistent coinfections, like HCMV, might lead to a vicious cycle of immune activation and reservoir seeding (Maidji et al., 2017). Human cytomegalovirus (HCMV) is one of the highly prevalent human herpesviruses that cause OIs in HIV patients. Although it has a global endemicity, it is more widespread in developing countries than in developed countries (Kiros et al, 2021). The HCMV can ordinarily be contained by the cellular immune response and hence often categorized as a self-limiting infection in healthy individuals (Okonko et al., 2023).

According to Perrello et al. (2019), HCMV is a factor that accelerates the course of HIV illness and is linked to immune-activation and inflammation in people living with HIV. Both the HIV virus and cytomegalovirus are known to cause inflammation and premature ageing in infected persons (Effros, 2015).

Depending on the person's immunological state, HCMV may cause modest to severe difficulties in their clinical presentations. Symptoms that are similar to mono may manifest in a variety of ways, including but not limited to: exhaustion, lack of appetite, swollen liver or spleen, sore throat, enlarged lymph nodes, fever, and malaise. Loss of appetite, yellow eyes, nausea, and diarrhoea are some of the symptoms and indicators that may be associated with hepatitis. Retinitis, encephalitis, colitis, inflammation of the liver, heart, and brain, among other disorders, may be caused by it in patients with impaired immune systems. It affects almost every organ in the body.

Among HIV-infected patients with advanced illness, CMV retinitis is the most prevalent HCMV manifestation; it is responsible for 85% of all CMV complications and causes blindness in many people (Edwin et al., 2021; Gianella & Letendre, 2016).

This study explored the prevalence, impact, and clinical manifestations of HCMV coinfection in HIV-positive individuals in Port Harcourt. The research aimed to provide valuable insights that can enhance patient care and enhance future studies.

2. MATERIALS AND METHODS

2.1 Study Area

University of Port Harcourt Teaching Hospital (UPTH) in Port Harcourt, Rivers State, Nigeria, a tertiary health institution providing comprehensive healthcare services, including HIV care and monitoring. Port Harcourt, Rivers State, Nigeria: A metropolitan setting with a high patient load for HIV care, diverse sociodemographic groups, and relevance for regional infectious disease surveillance. OPD and HIV clinics at UPTH where patients routinely present for ART initiation, CD4 count monitoring, viral load testing, and opportunistic infection screening. UPTH has a large cohort of HIV patients, diagnostic laboratory capacity, and systematic patient records that support seroepidemiological research.

2.2 Study Design

A cross-sectional seroepidemiological design based in a hospital was used for this investigation. Blood samples from HIV-positive patients visiting the University of Port Harcourt Teaching Hospital (UPTH) in Rivers State, Nigeria, were collected and analyzed at one particular time. The design was suitable for identifying the seroprevalence of prior Human Cytomegalovirus (HCMV) infection in HIV-positive patients, as determined by the presence of anti-HCMV IgG antibodies. To assess their relationship with HCMV seropositivity, sociodemographic and clinical information (such as age, sex, ART status, and CD4 count) were collected. Without follow-up, this cross-sectional method enabled effective disease burden estimation and risk pattern identification within the study population.

2.3 Study Population

This study was cross-sectional study consisting of 93 HIV-infected individuals visiting a major health institution in Rivers State. The study involved HIV-infected individuals attending UPTH for routine care, antiretroviral therapy (ART), or clinical follow-up. Human Cytomegalovirus (HCMV), a ubiquitous herpesvirus that establishes lifelong infection and is commonly reactivated in immunocompromised hosts, especially people living with HIV. HIV-infected individuals are at increased risk of HCMV reactivation and complications. Understanding the prevalence of *past HCMV infection* (seropositivity) can inform clinical management, prevention strategies, and health policy in the region. The 93 participants included in this study were eligible participants who were 18 years and above, HIV positive and gave their consent. On the other hand, all subjects who were below 18 years were excluded from the study.

2.4 Laboratory analysis

Plasma was analysed for the presence of HCMV IgG at the University of Port Harcourt's Virus & Genomics Research Unit of the Department of Microbiology.

2.4.1. HCMV IgG Serological Analysis

The IgG content of plasma samples was measured using a DIA.PRO, Milano-Italy ELISA kit. The manufacturer's instructions were followed for conducting the analysis. Interpretation was done according strict the manufacturer's instructions. The results were interpreted using the sample OD450nm to cut-off value ratio and the following values: S/Co < 1.0: Negative, If the S/Co ratio calculated is below 1.0, the test outcome is regarded as negative. This suggests that the level of HCMV IgG antibodies in the sample is below the required threshold for positivity. 1.0 ≤ S/Co ≤ 1.2: Equivocal - If the S/Co ratio falls between 1.0 and 1.2, the outcome is considered equivocal. This indicates that the level of HCMV IgG antibodies is uncertain and cannot be definitively classified as either positive or negative. S/Co ≥ 1.2: Positive When the S/Co ratio is equal to or exceeds 1.2, the test outcome is interpreted as positive. This signifies the presence of a notable quantity of HCMV IgG antibodies in the sample.

2.5. Data analysis

Microsoft Excel version 2021 (Microsoft, USA) was utilized to evaluate the data. The statistical significance of every analysis was determined where appropriate using the Chi-square test or Fisher's exact test at a 5% significance threshold.

2.6 Ethical consideration

The study was conducted after obtaining ethical clearance from the University of Port Harcourt Research Ethics Committee. The ethical conduct of the work was approved by the University of Port Harcourt Research Ethics Committee. The participants

demographic information were obtained through the administration of standardised questionnaires.

3. RESULTS

3.1. Analysis of Study Participants' Socio-demographic Characteristics and Seropositivity

The socio-demographic characteristics of the participants of the study is revealed in Table 1. The sample involves a total of 93 participants out of which 39(41.9%) were males and 54 (58.1%) were females. With respect to age distribution, 1(1.08%) of the participants were within the age range of <24 years, the majority of the participant 75 (80.6%) were in the participants were of the age range of 25-44 years, 11(11.8%) of the participants were in the age range of 45-54 years, and 6(6.5%) of the participants were > 60 years of age. With regards to marital status, 44 (47.3%) of the participants were reportedly single, 40(43.0%) of the participants were married, 3 (3.2%) of the participants reported to be divorced and 6(6.5%) were widowed. The educational background of the participants was as follows: 25 (26.9%) of the participants reported to have at least completed primary school, 31 (33.3%) of the participants had attained secondary education, 21 (22.6%) of the participants had attained tertiary education and 18 (19.4%) of the participants reported to had no education. With regards to their employment status, 12 (12.9%) were recorded to be students, 12(12.9%) were recorded to be employed, 18(19.4%) were reportedly unemployed and 51(54.8%) were self-employed. Furthermore, with regards to religion, an overwhelming number were recorded for Christians 82(88.2%), 4(4.3%) were recorded for Islam, 5(5.3%) were recorded for traditionalist and, 2(2.15%) for none. Lastly, based on the use of ART, 92(98.9%) were recorded for ART use and only 1(1.08%) were recorded for no-ART.

3.2. Statistical Relationships

The overall risk of HCMV infection among the study population is reported in Table 1. Also, with respect to their statistical analysis, all sociodemographic characteristics showed statistical significance (p=.001) except the educational level (p=0.147).

Table 1: Statistical Relationship of the study population and HCMV IgG seroprevalence

Variables	Categories	No. Seropositive (%)	X^2	P- Value	Significance
Age group (years)	<24	1(1.08)	207.6	<.001	Significant
	25-44	75(80.6)			
	45-59	11(11.8)			
	>60	6(6.5)			
Gender	Male	39(21.0)	4.84	0.028	Significant
	Female	54(29.0)			
Marital status	Single	44(23.7)	81.36	<.001	Significant
	Married	40(21.5)			
	Divorced	3(1.6)			
	None	6(3.2)			
Religion	Christianity	82(44.1)	264..2	<.001	Significant
	Islam	4(2.15)			
	Tradition	5(2.7)			
	None	2(1.08)			
Education	Primary	25(13.4)	5.36	0..147	Not significant
	Secondary	31(16.7)			
	Tertiary	21(11.3)			
	No education	18(9.7)			
Occupation	Student	12(6.5)	60.26	<.001	Significant
	Employed	12(6.5)			
	Unemployed	18(9.7)			
	Self-employed	51(27.4)			
ART usage	On ART	92(49.5)			
	Not on ART	1(0.5)			
Total		**93(100.0)**			

4. DISCUSSION

In the context of HIV-positive individuals and the advancement of HIV illness, HCMV represents a significant opportunistic pathogen. There seems to be some evidence linking HCMV seropositivity to overall mortality in the HIV population, according to many studies (Stockdale et al., 2018). Serological markers (IgG and IgM antibodies) against HCMV were used to ascertain the seroprevalence of infection among study participants. The seroprevalence of HCMV IgG antibodies was found to be 100% in this investigation. Multiple studies have shown that different communities throughout the world have different amounts of Human Cytomegalovirus IgG seroprevalence.

The North East area of Nigeria has the highest incidence of Anti-HCMV IgG at 86.00% among HIV patients (Mukhtar et al., 2016). Similarly, among reproductive-age women in selected institutions, a prevalence of 94.70% anti-HCMV IgG was recorded (Umeh et al., 2015). Here we find that 100% of the study populations are seropositive for HCMV IgG antibodies irrespective of their socio-demographic status. This finding corroborates the report of 100% HCMV IgG seroprevalence among HIV positive patients in Borno State (Ibrahim et al., 2014) and in Illorin (Baba-Ali et al., 2025). other findings in sub-Saharan African countries where high levels of HCMV seroprevalence have been found: 99.9% in Zimbabwe (Mhandire et al, 2019), 95% in Uganda (Stockdale et al., 2018), 99% in Gambia, 86% in South Africa, 97% in Benin, 97.2% of IgG against Cytomegalovirus in Lagos, Nigeria (Nwafor et al., 2017), in Ghana, a 100% prevalence of CMV IgG among tested 172 pregnant women (Völker et al., 2017), in Namibia 100% prevalence of CMV IgG (Vander et al., 2019) and 86.8% in Kano (Surajo et al., 2025).

The study recorded higher seroprevalence in females (58.1%) than in males (41.9%). This contradicts previous findings of seroprevalence of HCMV in HIV-infected individuals: higher in males (76.3%) than in females 72.7% in North Central Africa (Udeze et al., 2018), 82.6% among the males and 75.3% in females (Pennap et al., 2016), and males (100%) and females (98%) in Rivers State (Okonko et al., 2022). The rate of seropositivity of HCMV IgG antibody among the singles recorded 50%, which is higher than that of married individuals (44.1%). This may be a result of increased sexual activities among the young adults. The divorced and neutral categories had lower seropositivity of 4(2.15) and 7(3.8), respectively. An alarming seroprevalence was obtained among Christians (88.2%), while the other categories were lower. This finding corroborates future findings: 77% seroprevalence among Christians in Edo State (Moses-Otutu et al., 2023), 100% prevalence of CMV IgG in self-employed individuals in Port Harcourt (Okonko et al., 2022). Similarly, a 2023 study by Okonko et al. (2023) on HIV-infected patients reported that 100% of self-employed participants (including traders and artisans) were positive for CMV IgG.

Based on age range, a higher seropositivity was obtained among young adults between 25 and 44 years. This could be due to the sexually active nature of this age group. A few previous studies agree with this data: In Makurdi, IgG prevalence was found to be significantly high across all adult age groups, reaching 100% in participants over 40 (Baba-Ali et al., 2025). Based on educational levels, individuals in the secondary education showed higher seroprevalence (33.3%) compared to the others, primary (26.9%), tertiary (22.6%), and no education (19.4%). With respect to occupation, self-employed category showed higher seroprevalence (54.8%) compared to the others. Based on the use of ART, patients using ART showed 98.9% seroprevalence to HCMV IgG antibody compared to those without the use of ART (1.08%).

5. CONCLUSION

HCMV has evolved many tactics to live with HIV and the human immune system. The high seropositivity of HCMV in this study among HIV-infected individuals reflects the need for proper control of coinfections. Ultimately, the interplay between HIV and CMV underscores the need for vigilant screening, early intervention, and integrated care strategies. This study underscores the significant epidemiological and clinical burden of HIV/HCMV coinfection in the era of widespread ART. The findings confirm that CMV seroprevalence remains markedly higher in people living with HIV (PLWH), with prevalence exceeding 90%. The study further reveals that sociodemographic factors such as sex, occupation, marital status, education, and religion contribute to HCMV seroprevalence among PLWH. These findings reaffirm that HCMV is not merely a background infection but a key cofactor in HIV disease progression and comorbidities, particularly among young adult populations.

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