

SJMLS - 10(1) - 022

Occurrence of Cytomegalovirus and Human Immunodeficiency Virus Among Antenatal Women in University of Port Harcourt Teaching Hospital

Moore-Igwe, Beatrice W.* and Chukwu, Priya Homa

Department of Medical Laboratory Science, Rivers State University, Port-Harcourt, Nigeria

Author for Correspondence*: beatrice.moore-igwe1@ust.edu.ng/Orcid ID: 0000-0002-3660-7002.
<https://dx.doi.org/10.4314/sokjmls.v10i1.22>**Abstract**

The potential effects of cytomegalovirus (CMV) and human immunodeficiency virus (HIV) on maternal and neonatal health make them serious public health concerns, especially for pregnant women. This study aims to determine the occurrence of CMV and HIV among antenatal women and to assess the relationship between CMV-HIV co-infection. A cross-sectional study design was employed, involving 100 participants, and information collated through questionnaires and serological tests using Abbot HIV – 1/2 rapid test kit and TORCH IgG/IgM Combo rapid test Cassette for Human Immunodeficiency Virus and Cytomegalovirus for detection of infection respectively. The study revealed overall prevalence of CMV infection as 6% while no HIV infection was noted in the study population. Hence, there was no co-prevalence of HIV and CMV infection in the study population. Also, CMV infection was significantly not distributed in the study population ($p = 0.0129$). While 100% of participants were aware of HIV transmission, only 15% had knowledge of CMV. From the study, pregnant women had a 6% occurrence of cytomegalovirus (CMV) and 0% HIV infections, co-infection was not seen. 15% of participants knew about CMV transmission, and the distribution of CMV infection was statistically insignificant. The absence of HIV-positive cases in this study may be due to the small sample size or the criteria for selection of participants, which may not fully represent the general population. Increased awareness campaigns, regular CMV screening, preventive measures, larger research to understand the occurrence of CMV and improved antenatal services to guarantee early detection and therapy.

Keywords: Prevalence, Cytomegalovirus, Human Immunodeficiency Virus, Antenatal, Attendees**Introduction**

The potential effects of cytomegalovirus (CMV) and human immunodeficiency virus (HIV) on maternal and neonatal health make them serious public health concerns, especially for pregnant women. With a prevalence ranging from 0.2% to 2.5% of live births, CMV, a member of the Herpesviridae family, is one of the most frequent causes of congenital infections globally (Manicklal *et al.*, 2017). When transmitted in utero, it can cause serious complications like hearing loss, intellectual disability, and neurodevelopmental delays in neonates, but it is frequently asymptomatic in immunocompetent people (Boppa *et al.*, 2022). The cytomegalovirus (CMV) is a common virus that can induce harmful end-organ dysfunction in immunocompromised individuals with congenital CMV infection and can also be asymptomatic (Gupta & Shorman, 2023). Routine CMV screening during pregnancy is still mostly disregarded in many climes, especially in low-resource settings, despite its clinical importance (Rawlinson *et al.*, 2017).

HIV remains a significant global health concern, with sub-Saharan Africa bearing the highest burden, accounting for more than 60% of all new infections among pregnant women (UNAIDS, 2023). The interplay between HIV and CMV is of increasing concern, as HIV-induced immunosuppression increases the risk of CMV reactivation, leading to accelerated disease

progression and increased morbidity and mortality (Cannon *et al.*, 2022). Research has shown that CMV seroprevalence is significantly higher among HIV-positive individuals, with rates exceeding 90% in some populations (Mwaanza, 2021). Additionally, co-infection has been linked to increased risks of mother-to-child transmission (MTCT) of both viruses, preterm birth, and unfavorable neonatal outcomes (Gantt, 2022). Pregnant women are more susceptible to CMV infection as the immune system becomes compromised during pregnancy, this makes cytomegalovirus infection or reactivation to ride on the weakened or compromised immunity.

Awareness and regular CMV screening are still insufficient, despite increasing evidence of the clinical consequences of CMV-HIV co-infection. Many antenatal care (ANC) programs neglect CMV screening and preventive interventions in favor of HIV testing and MTCT prevention (Mussi-Pinhata & Yamamoto, 2023). This disparity in antenatal care highlights the need for improved maternal health policies that incorporate CMV screening, education, and management into routine antenatal care. Determining the prevalence of CMV and HIV in antenatal women, evaluating the correlation between CMV and HIV co-infection, and investigating potential risk factors for these infections are the intention of this study.

Materials and Methods

Study Design

A cross-sectional study was used to assess the prevalence of cytomegalovirus (CMV), and Human Immunodeficiency Virus (HIV) among pregnant woman at a specific point in time, which allows for the simultaneous collection of data on multiple variables without the need for long-term follow-up

Study Area

The University of Port Harcourt Teaching Hospital (UPTH) is a tertiary healthcare facility located in Alakahia, Port Harcourt, the capital of Rivers State, Nigeria. It serves as a key center for medical education, research, and healthcare delivery to a diverse population, including urban and peri-urban communities with varying socioeconomic statuses in the region, focusing on various departments such

as antenatal care, providing services to pregnant women from various ethnic, educational, and income backgrounds with a suitable environment for studying disease prevalence due to the diversity of its patient population and the regions high prevalence for infectious diseases.

Study Population

The study comprised of Pregnant women between the age of 18 to 45 years, attending antenatal clinic in University of Port Harcourt Teaching Hospital, Port Harcourt. Consent was obtained after preparing the subjects of the study. Interested participants were enrolled and demographic characteristics were obtained by the use of a detailed questionnaire.

Blood Sample Collection, Processing and Storage

Two milliliters (ml) of blood sample were collected into plain bottle (anticoagulant – free) by standard venipuncture technique as described by (Jane-Shaw, 2018), from each participant. The sample was transported from the site of collection in a stoppered cooler to the laboratory for analysis.

Methodology

Determination of Cytomegalovirus\ Human Immunodeficiency Virus

The cytomegalovirus serological rapid test was adopted, using TORCH IgG/IgM Combo Rapid test cassette, for the detection of antibody-antigen reaction. The Human immunodeficiency virus serological rapid test was adopted, using Abbott HIV-1/2 for the detection of antibody-antigen reaction in test sample.

Statistical Analysis

Results from the study were analyzed using Statistical Package for Social Sciences (SPSS) version 20. Statistics were presented in tables as means and standard deviation and comparison between the group means and standard deviation was enabled by using t-test.

Ethical Consideration

The University of Port Harcourt Teaching Hospital's Ethics and Research Committee granted ethical clearance for the study.

Results

Table 1: Socio-demographic Characteristics of the Study Population

Variables	Frequency (%)	Chi square value	P-value
Age			
17-19	1 (1)	45.53	< 0.0001
20-29	32 (32)		
30-39	59 (59)		
40-49	8 (8)		
Educational Status			
Informal/Primary	0 (0)	42.20	< 0.0001
Secondary	38 (38)		
Tertiary	62 (62)		
Occupation			
Unemployed	4 (4)	30.69	< 0.0001
Employed	60 (60)		
Employed	36 (36)		
Religion			
Christianity	99 (99)	63.19	< 0.0001
Muslim	1 (1)		
Ethnicity			
Ikwerre	17 (17)	9.795	0.0204
Igbo	37 (37)		
Ibibio	10 (10)		
Others	36 (36)		
Marital status			
Married	98 (98)	59.88	< 0.0001
Single	2 (2)		
Parity			
None	28 (28)	35.26	< 0.0001
1-3	68 (68)		
Above 3	4 (4)		
Gestational Age			
1-12 weeks	11 (11)	14.64	0.0007
13-27 weeks	48 (48)		
28-40 weeks	41 (41)		
No. of ANC visits			
1-4	62 (62)	39.19	< 0.0001
5-10	37 (37)		
Above 10	1 (1)		
Total	100(100)		

Table 2: Prevalence of HIV and CMV in the Study Population

	N	HIV n (%)	CMV n (%)	Chi Square (χ^2)	P-value
Groups					
Infected		0 (0)	6 (6)		
Non infected		100 (100)	94 (94)		
Total	100	100 (100)	100 (100)	6.186	0.0129

Key: N – Total number of subjects
n – Number of infected and uninfected subjects
P<0.05=Significant

Table 3: Awareness and Knowledge About HIV and CMV Infection in the Study Population

Variables	Frequency (%)	Chi square value	P-value
Awareness of HIV transmission			
Yes	100 (100)		
No	0 (0)	66.67	< 0.0001
Previous knowledge of CMV			
Yes	15 (15)		
No	85 (85)	27.92	< 0.0001
Knowledge of CMV transmission			
Yes	15 (15)		
No	85 (85)	27.92	< 0.0001
Risk exposure to HIV and CMV			
Yes	20 (20)		
No	80 (80)	19.78	< 0.0001
Previous blood transfusion			
Yes	4 (4)		
No	96 (96)	53.68	< 0.0001
Frequency of ANC visits			
Yes	70 (70)		
No	30 (30)	8.333	0.0039
Awareness of ANC tests			
Yes	70 (70)		
No	30 (30)	8.333	0.0039
Willingness for HIV/CMV tests			
Yes	100 (100)		
No	0 (0)	66.67	< 0.0001
Total	100 (100)		

Discussion

The study showed that none of the 100 study participants tested positive to HIV (0%), while 6% tested positive to cytomegalovirus (CMV). The remaining 94% were uninfected with CMV. The chi-square test result ($\chi^2 = 6.186$) and the p-value (0.0129) indicate a statistically significant association between CMV infection and the study population, suggesting that CMV prevalence is notable in this cohort. According to the 2022 UNAIDS Global HIV Report, Nigeria has an HIV prevalence of approximately 1.4% among adults (UNAIDS, 2022). The absence of HIV-positive cases may be attributed to effective public health interventions, including increased awareness, prevention programs, and improved access to antiretroviral therapy (ART) in Nigeria (NACA, 2022). Additionally, the sample population may consist of individuals with lower-risk behaviors or those who have undergone routine HIV screening and prevention measures.

Similarly, the prevalence of CMV infection (6%) is lower than findings from other studies in Nigeria. For example, a study by Adewumi *et al.* (2020) in South-West Nigeria found a CMV prevalence of 72.5% among antenatal women. The lower prevalence observed in this study could be attributed to factors such as improved healthcare practices, better sanitation, or demographic differences in the study population. CMV is a common viral infection with high seroprevalence in developing countries. Transmission occurs through direct contact with body fluids, such as saliva, urine, and blood, particularly in crowded settings (Cannon *et al.*, 2019). The observed prevalence in this study may be lower than expected due to factors like improved hygiene, awareness, and socioeconomic differences in the study population.

The results indicate significant disparities in awareness, risk exposure, and willingness for screening, with statistical significance observed across all variables ($p < 0.05$). The study found that all participants (100%) were aware of HIV transmission, which aligns with previous studies highlighting widespread awareness due to extensive public health campaigns (UNAIDS, 2022; NACA, 2023). The high awareness level is likely due to continuous sensitization efforts

through media, healthcare institutions, and educational programs. Similar studies by Adogu *et al.* (2019) and Okonkwo *et al.* (2021) also reported near-universal awareness of HIV transmission in Nigeria.

In contrast to HIV awareness, only 15% of participants had prior knowledge of CMV and its transmission, indicating a significant gap in public health education about CMV. This finding is consistent with research by Cannon *et al.* (2020), which highlighted low public awareness of CMV despite its potential risks in pregnancy and immunocompromised individuals. The significant Chi-square values (27.92, $p < 0.0001$) suggest that CMV remains a neglected area in public health communication (Kenneson & Cannon, 2019).

The study found that 20% of participants reported potential risk exposure to HIV and CMV. This is relatively low, considering the fact that high-risk behaviors, such as unprotected sex and blood transfusion, are known transmission routes (Fowler *et al.*, 2021). Previous studies (Nkwo *et al.*, 2020) have emphasized that lack of knowledge about CMV contributes to increased risk, particularly among pregnant women. The significant Chi-square value (19.78, $p < 0.0001$) suggests that while risk perception is acknowledged, more education is needed to mitigate exposure.

Only 4% of the participants had received a blood transfusion, which is lower than figures reported in previous studies in similar settings (Adebayo *et al.*, 2018). Given the stringent blood screening measures in Nigeria (Nigerian Blood Transfusion Service, 2022), the low percentage may reflect improved blood safety policies. The significant Chi-square value (53.68, $p < 0.0001$) reinforces the importance of screening in reducing transfusion-transmitted infections (TTIs).

A notable 70% of participants had regular ANC visits and were aware of ANC tests, showing a significant relationship (Chi-square: 8.333, $P = 0.0039$). This finding aligns with WHO (2022) recommendations on maternal healthcare, which stress that ANC visits improve maternal and fetal health outcomes. Studies by Akinyemi *et al.* (2021) reported similar ANC participation rates among pregnant women in urban Nigerian

hospitals. However, the 30% who did not attend ANC suggests potential barriers such as financial constraints or lack of education (Adepoju *et al.*, 2019).

All participants (100%) expressed willingness to undergo HIV and CMV testing. This is an encouraging finding, suggesting that health interventions promoting routine screening have been effective (NACA, 2023). Similar high acceptance rates have been reported in studies on HIV voluntary counseling and testing (VCCT) programs (Okeke *et al.*, 2021). The significant Chi-square value (66.67, $p < 0.0001$) highlights the effectiveness of existing HIV screening programs, though CMV screening awareness remains poor.

Conclusion

The study shows that pregnant women have a 6% occurrence of cytomegalovirus (CMV) and 0% HIV infections respectively, with no evidence of co-infection. Only 15% of participants knew that CMV can spread. The absence of HIV-positive cases in this study may be due to the small sample size or the criteria for selection of participants, which may not fully represent the general population. Stronger antenatal care to guarantee early detection and management, regular CMV screening, preventive measures, greater studies to understand CMV prevalence and co-infection risks, and more awareness campaigns are strong recommendations.

References

- Adebayo, A. M., Akinyemi, O. O., & Cadmus, E. O. (2018). Blood transfusion safety: Knowledge, attitude, and practice among health practitioners in Nigeria. *African Journal of Blood Transfusion*; **12**(2): 45-56.
- Adepoju, A., Fasina, F., & Adeniyi, O. (2019). Socioeconomic determinants of antenatal care utilization in Nigeria. *Maternal and Child Health Journal*; **23**(4): 512-523.
- Adewumi, M. O., Olajide, O. M., & Adebayo, A. T. (2020). Seroprevalence of cytomegalovirus among pregnant women attending antenatal clinics in South-West Nigeria. *African Journal of Infectious Diseases*; **14**(2): 85-92.
- Adogu, P. O., Udigwe, G. O., & Ubajaka, C. F. (2019). HIV/AIDS awareness and perception among adolescents in Nigeria. *African Journal of Reproductive Health*; **23**(1): 84-92.
- Akinyemi, A. I., Okonkwo, I. P., & Umeora, O. (2021). Maternal healthcare utilization among Nigerian women: Evidence from demographic and health surveys. *BMC Pregnancy and Childbirth*; **21**: 302.
- Cannon, M. J., Schmid, D. S., & Hyde, T. B. (2020). Review of cytomegalovirus (CMV) transmission and prevention strategies. *Pediatrics*; **146**(3): e20193058.
- Fowler, K. B., Stagno, S., & Pass, R. F. (2021). Maternal and congenital cytomegalovirus infections: Clinical impact and epidemiology. *Clinical Infectious Diseases*; **73**(4): 674-685.
- Gantt, S. (2022). Mixed cytomegalovirus genotypes in HIV-positive mothers show anatomic compartmentalization and transmission to infants. *eLife*; **11**: e63199.
- Gupta, M., & Shorman, M. (2023, August 8). *Cytomegalovirus*. StatPearls - NCBI Bookshelf. www.ncbi.nlm.nih.gov/books/NBK459185/
- Kenneson, A., & Cannon, M. J. (2019). Review and meta-analysis of the epidemiology of congenital CMV infection. *Pediatrics*; **123**(6): e1435-e1445.
- Manicklal, S., Emery, V. C., Lazzarotto, T., Boppana, S. B., & Britt, W. J. (2013). The history of cytomegalovirus: an overview. *Reviews in Medical Virology*; **23**(4): 171-177.
- Mussi-Pinhata, M. M., Yamamoto, A. Y., & de Lima, M. A. (2023). Risk of cytomegalovirus seroconversion in pregnant women in a population with high CMV seroprevalence. *Journal of Clinical Virology*; **94**: 1-5.
- Mwaanza, M. (2021). Prevalence of cytomegalovirus in people living with the human immunodeficiency virus in Niger. *Journal of Clinical Microbiology and Antimicrobials*; **2**(4): 14.
- National Agency for the Control of AIDS (NACA). (2023). Nigeria's HIV/AIDS response progress report. Retrieved from <https://naca.gov.ng>
- Nigerian Blood Transfusion Service. (2022). National Blood Safety Policy. Abuja:

- Federal Ministry of Health.
Nkwo, P. O., Egwuatu, V. E., & Umeora, O. U. (2020). Cytomegalovirus infection in pregnancy: Knowledge and screening among Nigerian women. *Tropical Medicine and International Health*; **25(3)**: 310-319.
- Okeke, I. O., Eze, P. I., & Ogbuagu, C. (2021). Voluntary HIV testing and counseling: Uptake and barriers among women attending antenatal clinics in Nigeria. *BMC Public Health*; **21**: 450.
- Rawlinson, W. D., Naing, Z. W., Scott, G. M., Shand, A., Hamilton, S. T., van Zuylen, W. J., Basha, J., Hall, B., & Craig, M. E. (2017). Congenital cytomegalovirus infection in pregnancy: a review of prevalence, clinical features, diagnosis, and prevention. *Australian & New Zealand Journal of Obstetrics & Gynaecology*; **56(1)**: 9–18.
- UNAIDS. (2022). Global HIV/AIDS Report: Progress towards elimination. Retrieved from <https://www.unaids.org>.
- WHO. (2022). Antenatal care guidelines: Recommendations for a positive pregnancy experience. Geneva: World Health Organization.

Citation: Moore-Igwe, Beatrice W. and Chukwu, Priya Homa. Occurrence of Cytomegalovirus and Human Immunodeficiency Virus Among Antenatal Women in University of Port Harcourt Teaching Hospital. *Sokoto Journal of Medical Laboratory Science*; **10(1)**: 203 – 209. <https://dx.doi.org/10.4314/sokjmls.v10i1.22>

Copyright: This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.