

<https://doi.org/10.48047/AFJBS.8.2.2026.75-88>



African Journal of Biological Sciences

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

## Occurrence of Cytomegalovirus among pregnant antenatal and hospitalized women in Pointe-Noire, Kouilou department, Republic of the Congo

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Volume 8, Issue 2, Feb 2026

Received: 20 Dec2025

Accepted: 25 Jan 2026

Published: 28 Feb 2026

[doi:10.48047/AFJBS.8.2.2026.75-88](https://doi.org/10.48047/AFJBS.8.2.2026.75-88)

### Abstract

**Background:** Cytomegalovirus (CMV) is a common cause of congenital infections leading to serious neonatal complications. Despite high CMV seroprevalence in developing countries, data from the Congo are scarce. This study investigates CMV exposure among pregnant women in Pointe-Noire, Congo.

**Material and Methods:** A cross-sectional study was conducted from October 2023 to February 2024 with 84 pregnant women attending three healthcare facilities in Pointe-Noire. Sociodemographic, obstetric, and clinical data were collected via questionnaire. Serum samples were tested for CMV-specific IgG antibodies using ELISA. Statistical analyses evaluated associations with CMV seropositivity.

**Results:** The samples came from antenatal units (72.6%) versus hospitalization wards (27.4%). The overall IgG seropositivity rate was 98,8%. The very high CMV IgG seropositivity 100% was: in women under 30; in informal and unemployed sectors; in primary and secondary education level and in the second and third trimesters of pregnancy. Clinical variables showed 100% positivity among women with fever, fatigue, headaches, joint pain, hypertension, and edema.

**Conclusion:** The study demonstrates a high prevalence of CMV IgG antibodies among pregnant women in Pointe-Noire, indicating widespread exposure. These findings underscore the importance of increased awareness and potential monitoring of CMV infections during pregnancy in the Republic of Congo

**Keywords:** Anti-CMV IgG seropositivity. Pregnant women. Congenital infection.

## Introduction

Cytomegalovirus (CMV), also known as human herpesvirus 5 (HHV-5), is an enveloped, double-stranded DNA virus belonging to the *Herpesviridae* family and the *Betaherpesvirinae* subfamily (Osita et al., 2024). CMV is primarily transmitted through close contact with the bodily secretions of an infected individual, such as saliva, semen, breast milk, urine, vaginal secretions and blood (CDC. 2025). Another key route of transmission is vertical transmission from mother to child, either through the placenta during pregnancy (Mahyuddin et al., 2020). CMV is a common cause of intrauterine viral infection and is a major contributor to hearing loss and neurological impairments in children (Kabani et al. 2020). CMV infection in newborns can result in severe complications, including neurological sequelae such as hearing loss. Other organ impairments include hepatosplenomegaly, jaundice and microcephaly (Salomè et al. 2023). Infected newborns may also experience intrauterine growth restriction, often resulting in low birth weight. In severe cases, CMV infection can lead to death. While many newborns may have asymptomatic CMV infections, those who show symptoms at birth are at a higher risk of long-term, often debilitating consequences (Tziella et al. 2025). The seroprevalence of CMV varies significantly across the globe, ranging from 50% to 85% in European countries to nearly 100% in certain developing nations (Salomè et al. 2023). Studies in sub-Saharan Africa have reported seropositivity rates as high as 90% to 100% among adults, especially in Nigeria and Tanzania (Zenebe et al. 2021). In Central African countries, while data on CMV infection remain fragmented, some research shows active circulation of the virus, with seroprevalence rates as high as 93-96.5% among pregnant women, as seen in Cameroon and Angola (Mhandire et al., 2019). In contrast, in the Republic of Congo, only studies on blood donors have been published, reporting a seroprevalence of 83.3% for IgG and 21.1% for IgM (Brunel et al., 2024).

Despite its significant clinical impact, systematic screening for CMV in pregnant women remains a controversial topic. While routine screening may not be necessary for all pregnant women, antiviral treatments can be considered for severe cases of CMV infection (Zammarchi et al. 2023). In this context, it is crucial to further study the epidemiology of CMV in pregnant women in the Republic of Congo in order to provide more accurate and relevant data to improve the management

of maternal-fetal CMV infections. This work aims to contribute valuable insights to enhance the understanding and management of CMV infection during pregnancy.

## **Material and Methods**

### **Study area and Period**

The study was conducted in three healthcare facilities in Pointe-Noire including Ngoyo General Hospital, Adolphe Cissé Hospital and Army Chirurgical Clinic. These institutions were selected because they serve as referral centers for maternal care. Pointe-Noire is located in the Kouilou Department, Republic of the Congo. The study was carried out over a five-month period, from October 2023 to February 2024.

### **Study design**

A cross-sectional study was conducted among pregnant women who attended the selected healthcare facilities during the study period. The primary objective was to assess the seroprevalence of immunoglobulin G (IgG) antibodies against cytomegalovirus (anti-CMV IgG) in this population.

### **Study population and Procedure**

Pregnant women who attended antenatal consultations or were hospitalized in the selected health facilities were considered for enrollment based on the following inclusion criteria: all pregnant women, regardless of age or gestational age, who provided informed consent to participate were included in the study.

The sample size for this study was determined by the formula for single population proportion (Waje et al. 2025). A previous study on congenital infections due to cytomegalovirus among pregnant women in Cameroon reported a prevalence of 93% (0.93) (Kourouma et al. 2017), which was used to estimate the sample size. The minimum sample size required was estimated to be 100 participants.

### **Data collection**

A structured data sheet was used as an interviewer-administered questionnaire to collect information from study participants. The data collected included sociodemographic variables (age, occupation, level of education), obstetric variables (stage of pregnancy, parity, number of antenatal care visits), clinical variables (fever, headache, fatigue, hypertension, lower limb edema).

### **Sample collection**

About 5ml of venous blood was collected transferred into a ethylenediaminetetraacetic acid (EDTA) tube (Choodinatha et al. 2023). The collected samples were labeled and placed in a cooler then transported to the laboratory department at the Fondation Marie-Madeleine Gombes in Pointe-Noire. The blood sample was centrifuged at 1500rpm for 5min. The obtained serum was transferred into clean test tubes and stored at -80°C, until representative samples were obtained.

### **Detection of cytomegalovirus infection**

Cytomegalovirus infection was assessed detection of Cytomegalovirus DNA with the kit detection of CMV DNA by real-time PCR (Portugal) as well as by qualitatively detecting CMV-specific IgG using a commercial ELISA 96 wells kit Ab IgG ELISA (96T /box) (China), following the manufacturer's instructions. The kit included a pre-coated microplate, positive and negative controls, diluent, wash buffer (40x), enzyme conjugate, substrates A and B, and stop solution. After bringing all reagents to room temperature, the wash buffer was diluted 1:40. In each well, 100 µl of diluent and 10 µl of serum were added, along with 100 µl of controls in the appropriate wells. The plate was incubated at 37 °C for 20 min, washed five times, followed by the addition of 50 µl of enzyme conjugate and a second 20 min incubation. After another wash cycle, 50 µl each of substrates A and B were added, incubated for 10 minutes at 37 °C. The reaction was stopped by adding 50 µl of stop solution per well. Absorbance was read within 10 min at 450 nm with a reference wavelength of 630 nm.

### **Data analysis**

Data were analyzed using OriginPro software for histogram plotting and statistical analysis. Distribution of anti-CMV IgG levels was assessed in relation to different variables using the Chi-square test.

## Results

### Sampling

A total of 84 pregnant women were enrolled in the study across the three health facilities in Pointe-Noire. They came from various districts, with the highest numbers from Tie-Tie with 22 participants and Emery Patrice Lumumba with 20 participants. Other districts included Ngoyo with 17 participants, Mongo Mpoukou with 11 participants, Louandjili with 8 participants, Mvou-Mvou with 4 participants and a few from other areas with 2 participants.

Distribution of samples among the three health facilities was as follows with Ngoyo General Hospital 28 (33.3%), Adolphe Cissé Hospital 30 (35.7%) and Army Surgical Clinic 26 (31.0%) (Figure 1)

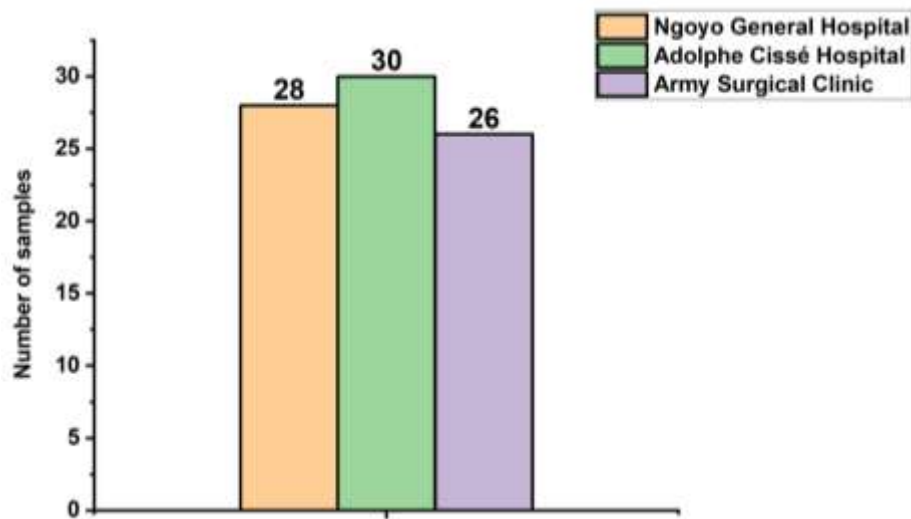
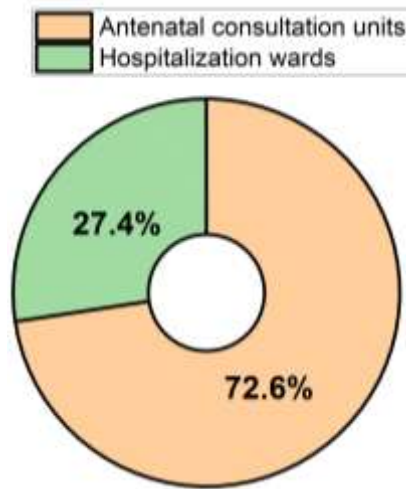


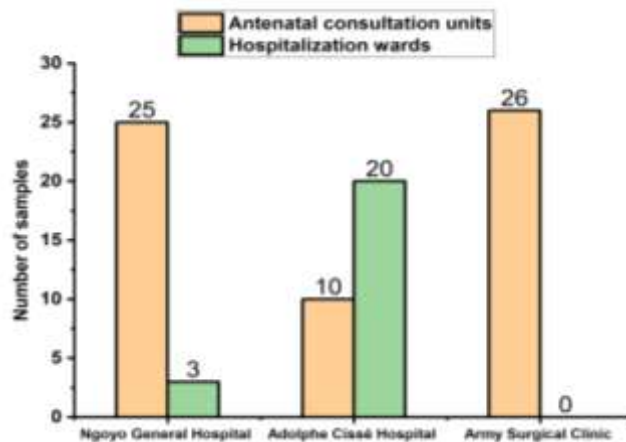
Figure 1. Distribution of samples collected by health facility in Pointe-Noire

Sample distribution across different areas within the three selected health facilities revealed that the majority were collected from the antenatal consultation units with 61 (72.6%) (**Figure 2**).



**Figure 2.** Sample distribution by collection area

Sample collection areas varied across the three health facilities. Most samples at Ngoyo General Hospital 25 (89%) and all at the Army Surgical Clinic 26 (100%) were obtained from antenatal consultation units, whereas the majority at Adolphe Cissé Hospital 20 (67%) came from hospitalization wards. Distribution of samples differed significantly ( $p < 0.05$ ) by collection area within each health facility (**Figure 3**).

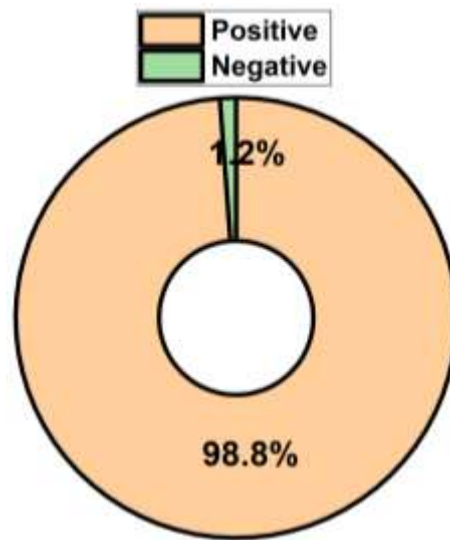


**Figure 3.** Sample distribution by collection areas within health facilities

**Detection of cytomegalovirus infection**

The CMV DNA was not detected in any pregnant women.

Detection of CMV IgG antibodies among pregnant women revealed that the vast majority, 83 (98.8%), tested positive (**Figure 4**).



**Figure 4.** Prevalence of CMV IgG among pregnant women

**Sociodemographic variables**

Analysis by age group shows a high frequency of CMV IgG antibodies across all age categories, with a slight increase in older women, but no significant difference in CMV IgG antibody positivity between age groups ( $p > 0.05$ ). All women under 20 years and those aged 20-30 years tested positive (**Table 1**).

**Table 1.** Distribution of CMV IgG antibody in pregnant women by age group

Variables	Frequency	Positive	Negative
< 20 years	19	19 (100%)	0 (0%)
20-30 years	29	29 (100%)	0 (0%)
≥ 30 years	36	35 (97%)	1 (3%)

Among pregnant women, CMV IgG antibody positivity was highest across (100%) in the informal sector and unemployed women. There was no significant difference ( $p > 0.05$ ), in CMV IgG positivity according to occupational status (**Table 2**).

**Table 2.** Distribution of CMV IgG antibody in pregnant women by occupation

Variables	Frequency	Positive	Negative
Formal sector	21	20 (95%)	1(5%)
Informal sector	53	53 (100%)	0 (0%)
Unemployed	10	10 (100%)	0 (0%)

CMV IgG antibody positivity was high across all education levels. Statistical analysis revealed a significant difference ( $p < 0.05$ ), in CMV IgG positivity according to education level (**Table 3**).

**Table 3.** Distribution of CMV IgG antibody in pregnant women by Level of Education

Variables	Frequency	Positive	Negative
Primary	7	7 (100%)	0 (0%)
Secondary	65	65 (100%)	0 (0%)
Higher	12	11 (92%)	1 (8%)

### Obstetric variables

Detection of CMV IgG antibodies in pregnant women based on the stage of pregnancy revealed that the highest positivity rates for those antibodies were observed in the 2nd and 3rd trimesters, with 100% of women in both groups testing positive. Statistical analysis showed a significant difference between trimester of pregnancy and CMV IgG positivity ( $p < 0.05$ ) (**Table 4**).

**Table 4.** Distribution of CMV IgG antibody in pregnant women by stage of pregnancy

Variables	Frequency	Positive	Negative
<b>1st trimester</b>	7	6 (86%)	1 (14%)
<b>2nd trimester</b>	54	54 (100%)	0 (0%)
<b>3rd trimester</b>	23	23 (100%)	0 (0%)

Parity distribution results indicate that the majority of pregnant women tested positive for CMV IgG antibodies, with 100% positivity among nulliparous, primiparous, and pauciparous women. Statistical analysis revealed no significant difference between parity and CMV IgG positivity ( $p > 0.05$ ) (Table 5).

**Table 5.** Distribution of CMV IgG antibody in pregnant women by parity

Variables	Frequency	Positive	Negative
Nulliparous	17	17 (100%)	0 (0%)
Primiparous	16	16 (100%)	0 (0%)
Pauciparous	19	19 (100%)	0 (0%)
Multiparous	32	31 (97%)	1 (3%)

CMV IgG antibody positivity was 100% in women with fewer than 2 antenatal visits. No significant difference was found between the number of visits and CMV IgG positivity ( $p > 0.05$ ) (Table 6).

**Table 6.** Distribution of CMV IgG antibody in pregnant women by number of antenatal care visits

Variables	Frequency	Negative	Positive
< 2	43	43 (100%)	0 (0%)
≥ 2	41	40 (98%)	1 (2%)

### Clinical variables

Among the 84 pregnant women enrolled, 8 reported fever, all of whom tested positive for CMV IgG antibodies (100%). One woman reported fatigue, also testing positive (100%). Additionally, 8 women reported headaches, all positive for CMV IgG (100%).

Regarding musculoskeletal and pelvic pain, five women reported joint pain, all of whom tested positive for CMV IgG antibodies (100%). However, for lower back pain and pelvic pain, 4 women reported lower back pain with 3 testing positive (75%), and 11 women reported pelvic pain with 10 testing positive (91%) for CMV IgG, respectively.

Distribution of CMV IgG antibodies in pregnant women by cardiovascular and circulatory signs revealed that 2 women reported high blood pressure, both testing positive for CMV IgG antibodies

(100%). Additionally, 1 woman reported lower limb edema, who also tested positive (100%) for CMV IgG.

## **Discussion**

Congenital cytomegalovirus infection remains a significant public health concern, particularly in developing countries. In Africa, CMV prevalence is notably high among pregnant women. This study confirms a high CMV IgG seroprevalence of 98.8% (83 out of 84) among pregnant women in Pointe-Noire, as detected by enzyme-linked immunosorbent assay (ELISA). This result aligns with existing data from sub-Saharan Africa, where CMV IgG seroprevalence among pregnant women ranges between 72% and 100% (Hailemariam et al., 2021). Such elevated rates are likely influenced by socioeconomic and environmental factors such as overcrowded living conditions and limited access to hygiene that facilitate early CMV transmission and continued exposure.

Sociodemographic variables were consistently high across all age groups, with no significant differences, aligning with (Zenebe et al., 2021), who found age was not a significant factor in CMV serostatus. This uniform seroprevalence may result from recurrent exposure maintaining high immunity throughout reproductive age. Occupational and educational status did not significantly influence CMV IgG positivity. A higher CMV positivity rate was observed among women across all educational levels, with primary (100%), secondary education (100%) and tertiary education (92%). These findings contrast with those of Katungye et al., 2025, who reported much lower CMV exposure rates among educated populations in Uganda, with primary (5%), secondary education (5%) and tertiary education (11%). The higher CMV positivity observed here may be due to regional differences, socioeconomic factors, or persistent exposure risks regardless of education level.

Obstetric factors revealed a significant increase in CMV IgG positivity with gestational age, reaching 100% in both the second and third trimesters ( $p < 0.05$ ). This observation is consistent with findings from Toriyabe et al., 2022, who also documented increased CMV IgG positivity as pregnancy progressed. These results underscore the importance of early antenatal screening, particularly in the first trimester, when primary infection poses the highest risk to fetal

development. Parity and the frequency of antenatal visits showed no statistically significant association with CMV serostatus, in agreement with the findings of Maingi et al., 2014 in their study of CMV prevalence among pregnant women in Thika, Kenya.

Clinically, non-specific symptoms such as fever, fatigue, and headache were commonly reported among CMV IgG-positive women. However, these symptoms lacked a statistically significant association with CMV serostatus due to the near-universal seroprevalence in the study population. Additionally, musculoskeletal and cardiovascular symptoms were observed in a few cases but were inconclusive in relation to CMV infection. These findings are in line with those of Gupta et al. (2025), who noted that primary CMV infection is frequently asymptomatic.

## **Conclusion**

This study confirms a very high CMV IgG seroprevalence among pregnant women in Pointe-Noire, consistent with trends across sub-Saharan Africa. CMV exposure was widespread regardless of age, education, or occupation. The increase in seropositivity with pregnancy stage highlights the importance of early antenatal screening. Although non-specific symptoms were common, they showed no significant link to CMV status, reinforcing the often asymptomatic nature of infection. Strengthening early screening could help reduce the risk of congenital CMV.

## **Data availability**

Data are available from the corresponding author upon request.

## **Ethical approval**

This study was conducted in accordance with the Declaration of Helsinki. The ethical approval by the Health Sciences Research Ethics Committee has been obtained (130-24/MESRST/CERSSA/-24).

## **Acknowledgements**

We thank all the pregnant women and the various health facilities for their participation in this study, as well as the Biomedical Analysis Laboratory of the Fondation Marie-Madeleine Gombes Polyclinic in Pointe-Noire.

## Declarations

**Funding:** NO

**Conflicts of interest:** N.A

**Author contributions:** Moyen designed project, provided the kits biological analysis, assisting with experiments and write article, Boumba has lab facilities to complete this research work. Celeste, Takale and Ombele made the experiments. Mottom, Dougaga and Loubaki facilitated data collection; Bidounga in the compilation of data, and data analysis. Okobo and Nguimbi elped in the manuscript writing and editing.

**Consent for publication:** The presented research work has not been submitted elsewhere and is not under consideration by any other journal. All authors have critically proofread the manuscript and approved it for publication in this Journal.

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