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Seroprevalence of Chikunguya Virus IgM in People Living With HIV in Port Harcourt

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ABSTRACT
It has been discovered that people living with Human Immunodeficiency Virus (HIV) constitute a particularly vulnerable group for Chikungunya virus (CHIKV) infection primarily transmitted through the bite of infected female mosquitoes, with *Aedes aegypti* and *Aedes albopictus* being the principal vectors. CHIKV-induced oxidative stress contributes to endothelial dysfunction and vascular permeability, which may underlie complications such as hemorrhagic manifestations in severe cases. This study investigated the co-infection of CHIKV in people living with HIV in Port Harcourt, Rivers State, Nigeria. Five milliliter (5ml) of blood samples were obtained through the vein puncture into an EDTA bottle (to prevent coagulation) during the months of June and July 2025 from consented male and female adults living with HIV, attending the antiretroviral clinic outpatients at the Rivers State University Teaching Hospital (RSUTH), Port Harcourt. A total of one hundred (100) blood samples were collected. The samples were centrifuged at 3000 rpm for 10 minutes and the plasma was separated into another tube and labeled appropriately. A DIA.Pro Chikunguya (Italy) ELISA kit was employed for the detection of the presence of the Chikunguya IgM and the assay was performed. Software minitab version 21.3 was used to analyze the data obtained. Of the 100 HIV-positive blood samples analyzed, only three (3) of them were detected to be co-infected with Chikungunya virus - HIV/CHIKV (3%). Of the 3 co-infected, Two (2) were females and one (1) was a male. The occurrence of HIV/CHIKV co-infection was found to be higher among people within the ages of 31 – 40. This shows that the seropevalence of the Chikunguya IgM in people living with HIV in Port Harcourt was low compared to previous studies in other places. This suggests that there is herd immunity against Chikunguya virus in Port Harcourt among people living with HIV. This is because there are still people living with HIV who do not have the protection against the virus and may have severe health consequences from the viral infection. The findings of this study underscore the importance of environmental sanitation as to eradicate or minimize the *Aedes* mosquitoes which are the transmitters of the virus.

Keywords: Chikunguya Virus, HIV, *Aedes aegypti*, ELISA, IgM, Endothelial Dysfunction, Hemorrhagic Manifestations.

Introduction

Chikungunya virus (CHIKV) is a virus, primarily transmitted through the bite of infected female mosquitoes, with *Aedes aegypti* and *Aedes albopictus* being the principal vectors (Zhao *et al.,* 2025). Chikungunya virus belongs to the Togaviridae family, under the Alphavirus genus, which includes viruses like Ross River virus and Mayaro virus, known to cause arthritis in humans (Kumar *et al.*, 2021). The inflammatory response to CHIKV infection is characterized by excessive cytokine production, commonly referred to as cytokine storm, which plays a key role in disease pathogenesis (de Souza *et al*., 2025).

Elevated levels of proinflammatory cytokines such as tumor necrosis factor-alpha (TNF-α), interleukin-6 (IL-6), and interferon-gamma (IFN-γ) are associated with severe joint inflammation and musculoskeletal damage (Adhikari *et al*., 2020). Monocyte and macrophage infiltration into infected tissues further exacerbates the inflammatory response, leading to synovitis and tissue remodeling (Kulakova *et al*., 2024). Additionally, CHIKV-induced oxidative stress contributes to endothelial dysfunction and vascular permeability, which may underlie complications such as hemorrhagic manifestations in severe cases (Oliveira-Neto *et al*., 2024).

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Persistent inflammation in the post-acute phase has been linked to chronic arthralgia, affecting a significant proportion of infected individuals, particularly older adults and those with preexisting conditions (Sun *et al*., 2025).

Historically, CHIKV infection was considered a self-limiting arboviral infection with acute febrile symptoms; however, emerging evidence points to its potential for multisystem involvement, including the kidneys (Bartholomeeusen *et al*., 2023). Case reports and autopsy studies have documented hepatic, renal, neurologic, and cardiac complications during the course of CHIKV infection (Mehta *et al*., 2018).

From the findings of Economopoulou *et al*. (2009), during the outbreak in Réunion Island, the study documented a higher-than-expected incidence of acute kidney injury (AKI) among hospitalized patients, particularly those with co-morbidities such as diabetes and hypertension.

People living with Human Immunodeficiency Virus (HIV) constitute a particularly vulnerable group for Chikungunya virus infection. HIV targets CD4+ T-cells, leading to immunosuppression that predisposes individuals to a wide range of opportunistic and co-infections (Pircher, 2020). From the study carried out by Pircher *et al*. (2020) it was noted that co-infection of HIV with CHIKV, had more prolonged illness duration and increased arthralgia severity compared to those with Chikungunya alone. Similarly, research in Latin America and parts of East Africa has suggested that co-infection could exacerbate both diseases (Olowolafe *et al*., 2024).

Despite these conditions, there is a paucity of data on the burden of Chikungunya in HIV-positive individuals in Nigeria, particularly in rural and peri-urban communities (Asaga Mac *et al*., 2022). The World Health Organization (WHO) has highlighted the need for more data on arboviral infections in immunocompromised populations, including those living with HIV (WHO, 2023).

Currently, there is no information on the data of the co-infection of CHIKV and HIV in Nigeria, hence this present study is aimed at determining the seroprevalence and co-infection of chikunguya virus (CHIKV) in people living with HIV in Port Harcourt, Rivers State, Nigeria.

Materials and Methods

Study Area

The blood samples for the study were collected from consented out-patients attending the antiretroviral clinic of the Rivers State University Teaching Hospital (RSUTH), in Port Harcourt, Rivers State, Nigeria during the months of June and July2025.

Ethical Approval

The ethical approval on the strength of which the study was carried out was obtained from the Rivers State University Teaching Hospital ethical health committee with the approval number RSUTH/REC/2024367.

Sample Collection and Serological Detection

Five milliliter (5ml) of blood samples were obtained through the vein puncture into an EDTA bottle (to prevent coagulation) from confirmed male and female adults persons living with HIV, attending the antiretroviral clinic outpatients (male and female adults) at the Rivers State University Teaching Hospital (RSUTH), Port Harcourt, Rivers State during the months of June and July2025. A total of one hundred (100) blood samples were collected from confirmed persons living with HIV. The samples were centrifuged at 3000 rpm for 10 minutes and the plasma was separated into another tube and labeled appropriately. These plasma samples were preserved by refrigerating at -70°C. The Chikunguya virus IgM was detected using the ELISA method with a DIA.Pro Chikunguya (Italy) ELISA kit for the detection of the presence of the Chikunguya IgM and the assay was performed in line with the manufacturer's instruction.

Statistical Analysis

Software minitab version 21.3 was used to analyze the data obtained.

Results

The result of the one hundred (100) confirmed HIV-positive blood samples analyzed for Chikunguya virus IgM showed that, only three (3) of the samples were detected to be co-infected with Chikunguya virus i.e., HIV/CHIKV (3%). Of these 3 (3%) who were co-infected, Two (2%) of them were females and one (1%) was a male.

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The result of the gender distribution of the total HIV/CHIKV co-infection and negative cases with their percentages are as presented in Table 1. The p – value of the positive samples compared with the negative samples was 0.00001 as seen on Table 1.

The distribution of the HIV/CHIKV co-infection and negative cases with their percentages within gender is presented in Table 2.

When compared within each gender, of the 49 males, only 1(2.04%) was positive with a p-value of 0.0002 and of the 51 females, only 2(3.92%) were found to be positive with a p-value of 0.0004 (Table 2).

The age distribution of HIV/CHIKV co-infection is shown in Table 3. The occurrence of HIV/CHIKV co-infection was found to be higher among people within the ages of 31 – 40 as seen on Table 3.

Table 1: Gender distribution of the total HIV/CHIKV co-infection and negative cases with their percentages

Gender	Total Tested	Positive Cases	Positive (%)	Negative Cases	Negative (%)	*P value*
Male	49	1	1	48	48	0.00001
Female	51	2	2	49	49	0.00001
Total	100	3	3	97	97	

Table 2: Distribution of the HIV/CHIKV co-infection and negative cases with their percentages within Gender

Gender	Total Tested	Positive Cases	Positive (%) within Gender	Negative Cases	Negative (%) within Gender	*P value*
Male	49	1	2.04	48	97.96	
Female	51	2	3.92	49	96.08	
Total	100	3	97	97		

Table 3: Age distribution of HIV/CHIKV co-infection

Age Range	Total Tested	Positive	Positive Percentage	Negative	Negative Percentage
10 - 20	3	0	0	3	100
21 - 30	28	0	0	28	100
31 - 40	38	2	5.3	36	94.7
41 - 50	16	0	0	16	100
51 -60	9	1	11.1	8	88.9
61+	6	0	0	6	100
Total	100	3		100	

Discussion

From the study carried out, it was discovered that the Chikunguya virus IgM was found in 3% of people living with HIV thereby indicating an ongoing co-infection. From the work done in Ethiopia among none HIV infected individual by Zerfu *et al.* (2024), a higher prevalence of 47% was obtained in contrast to that gotten in this study. Also from the work done by Akinola *et al*. (2017), 6.5% of the none HIV infected individuals tested positive to the Chikunguya virus IgM.

In Port Harcourt, a study was carried out among people presenting with malaria but negative to HIV by Azuonwu *et al.* (2024) and a prevalence of 2.5% was obtained from the study. For the study carried out among people living with HIV, a study was carried out in Martinique by Pircher *et al.,* 2020, of which 63% of the people tested were found to be positive to the Chikunguya virus which was far higher than the result obtained in this present study. This may be due to a larger population tested in the Martinique than that carried out in this study.

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Also, it may be due to herd immunity amongst people living with HIV who may have been previously exposed to the virus thereby limiting the number of new cases amongst people living with HIV in Port Harcourt than in Martinique. The seroprevalence of the Chikunguya virus among people living with HIV in this study agrees with the findings of Azuonwu *et al.* (2024) which was carried out in Port Harcourt, though on febrile patients. This suggests that there may be a herd immunity against the Chikunguya virus in Port Harcourt since the IgM against the virus was tested for in both cases.

From this study, the prevalence was higher among females than males. This agrees with the findings of all of the previous studies mentioned above. This may be due to the females being more active in sites where the *Aedes aegypti* mosquitoes which are the transmitters of the virus are bred such as the stream, bushes etc. thereby being more exposed to the virus infection.

Also, the number of males that tested positive (2.04%) to the chikunguya virus within the male gender was significantly lower than those who tested negative (97.96%) to the virus with a p-value of 0.0002 indicating a significantly low level of infection among the males. The number of females, who tested positive (3.92%) to the virus within the female gender, were also significantly lower than those who were negative (96.08%) to the virus with a p-value of 0.0004. For the age distribution, the Chikunguya virus as found among people within the ages of 51-60 years (11.1%) with the highest prevalence followed by those within the ages of 31 – 35 years (5.3%). The highest prevalence among people aged 51 – 60 years may be due to waning of the immunity found in the elderly as discovered from the work done by Doherty e*t al.* (2025) in which the immunity begins to wane as one grows older.

Conclusion

From the findings of this study, it was discovered that the seropevalence of the Chikunguya IgM in people living with HIV in Port Harcourt was low compared to previous studies in other places. This suggests that there is a herd immunity against the virus in Port Harcourt among people living with HIV. This is because there are still people living with HIV who do not have the protection against the virus and may have severe health consequences from the viral infection. The findings of this study underscore the importance of environmental sanitation as to eradicate or minimize the *Aedes* mosquitoes which are the transmitters of the virus.

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