A Comparative Epidemiological Study on the Incidence of Dengue and Chikungunya IgM Antibodies in Ile-Ife and its Environs

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ABSTRACT

Background: Dengue and Chikungunya remain under-recognized illnesses in Nigeria, which are are often misdiagnosed as malaria due to similar symptoms and lack of routine arboviral testing. This study investigated the prevalence of dengue and chikungunya among apparently healthy and febrile individuals presenting to selected healthcare facilities in Ile-Ife and its environs, Osun State, Nigeria.

Methods: A cross-sectional study was conducted among 164 consenting participants attending healthcare facilities across rural, peri-urban, and urban communities in three Local Government Areas (LGAs) in Ile-Ife. Venous blood samples were collected and screened for DENV IgM and CHIKV IgM using appropriate rapid diagnostic test kits. Necessary data to support the study were obtained from the participants using structured questionnaires.

Results: Dengue IgM was detected in 7.3% (12/164) while Chikungunya IgM was 0.6% (1/164) of the participants, with dengue cases distributed across all the three LGAs. Highest Dengue IgM was detected in the age group 11-20 and 21-30 (3%, 5/164). Both Dengue IgM and Chikungunya IgM are predominant in female with 11 (6.7%) for dengue and 1 (0.6%) for chikungunya. No individual was co-infected.

Conclusion: This study establishes recent dengue and chikungunya viruses exposure and a higher incidence of dengue in Ile-Ife. Both being RNA viruses calls for molecular analysis to know more about the adaptation strategies of the viruses. Strengthening differential diagnosis, improving community awareness, and enhancing vector control interventions are essential to improve case detection and reduce misdiagnosis.

Keywords: Dengue, Chikungunya, IgM, Antibodies

INTRODUCTION

Dengue and chikungunya are mosquito-borne viral infections that pose a serious threat to global public health. Both are caused by RNA viruses, dengue virus (DENV) and the chikungunya virus (CHIKV), respectively and are transmitted through *Aedes* spp. mosquitoes, primarily *Aedes aegypti* and *Aedes albopictus*, which are widely distributed across tropical and subtropical regions of the world (Abuelmaali *et al.,* 2021). Dengue virus, a member of the *Flaviviridae* family, causes a spectrum of illnesses ranging from undifferentiated fever to asymptomatic or mild febrile illness, dengue fever (DF), dengue haemorrhagic fever (DHF), and dengue shock syndrome (DSS) (Sharma *et al.,* 2022). Conversely, Chikungunya virus, a member of the *Togaviridae* family, causes symptoms including characteristic severe joint pain that can be debilitating, fever, joint swelling, muscle pain, nausea, fatigue, and rash. Since their symptoms overlap with each other, both DENV and CHIKV infections are easy to misdiagnose, contributing to the underestimation of their disease burden (Baharia *at al.,* 2025).

Globally, the incidence of dengue has grown dramatically, with the number of cases reported to WHO

increasing from 505 430 cases in 2000 to 14.6 million in 2024 which is now endemic in more than 100 countries (WHO, 2025). Chikungunya, first isolated in Tanzania in 1952, has similarly expanded in reach, now affecting over 110 countries, with global incidence rising from 0.28 to 11.13 per 100,000 between 2004 and 2024 (Wang *et al.*, 2026). However, in Nigeria, both diseases are endemic but many outbreaks go undocumented, and the true burden of endemicity remains undetermined due to lack of systematic studies, limited data, insufficient diagnostic capabilities, and misdiagnosis as malaria (Kolawole *et al.,* 2018). It has been reported that in Nigeria, arboviral infections are often misdiagnosed as malaria due to clinical resemblance to malaria and limited routine surveillance (Baba *et al*., 2012).

This study aims to comparatively assess the incidence of Dengue and Chikungunya IgM antibodies in Ile-Ife and its environs to provide data that can inform surveillance and control strategies.

MATERIALS AND METHODS

The study is a cross-sectional study involving 164 apparently healthy and those visiting the selected healthcare facilities for mild health issues such as febrile feelings and other malaria-like symptoms across the Ife Central, Ife East, and Ife North Local Government Areas in Ile-Ife, Osun State, Nigeria. The study area has a tropical rainforest climate with seasonal rainfall and high mosquito breeding potential. A questionnaire to obtain socio-demographic data, behaviours and exposure to mosquito, and health history was administered to consenting individuals.

After obtaining the ethics approval from the Health Research Ethics Committee of the Institute of Public Health, Obafemi Awolowo University, Ile-Ife, Nigeria and obtaining the consent of the participants, about 3 mL of venous blood was collected aseptically from each. The blood samples were then separated by centrifugation at 3,000 rpm for 15 minutes into serum and packed cells, and the serum samples were stored at -20 °C until analysis. The serum samples were serologically screened for Dengue virus IgM and Chikungunya IgM using Rapid Test Cassettes (Shandong Highplus Biotech, China and Nantong Diagnos biotechnology, China, respectively). The specificity and sensitivity of the dengue was found to be 96% and 97% respectively. The manufacturers instructions were followed in all the steps and the results taken after 15 minutes.. The data collected from the questionnaires and laboratory analyses were analyzed using Statistical Package for Social Sciences (SPSS) v23. Descriptive statistics were used to determine prevalence, and Chi-square tests assessed associations between variables. Significance was set at $p \leq 0.05$.

RESULTS

The mean age of the 164 participants was 29.06 years while the modal and median ages are 25 and 24 years respectively. The 10 out of the 12 (83.3%) individuals positive for the Dengue IgM were between ages 11 and 30 years whereas the only Chikungunya IgM positive individual in this study is between ages 31 - 40 years. The details of the distribution of the antibodies according to selected demographic data are as shown in Table 1.

Table 1: Distribution of dengue and chikungunya IgM antibodies in Ile-Ife and environs

Characteristics		DENV IgM			CHIKV IgM		
		+ve (%)	-ve (%)	pValue	+ve (%)	-ve (%)	pValue
Age	0-10	0(0)	19 (11.5)	0.448	0(0)	19 (11.6)	0.483
	11-20	5 (3)	28 (17.1)		0(0)	33 (20.1)	
	21-30	5 (3)	51 (31.1)		0(0)	56 (34.1)	
	31-40	1 (0.6)	21 (12.8)		1 (0.6)	21 (12.8)	
	41-50	0(0)	8 (4.9)		0(0)	8 (4.9)	
	51-60	0(0)	13 (7.9)		0(0)	13 (7.9)	

	61-70	1 (0.6)	10 (6.1)		0(0)	11 (6.7)	
	71-80	0(0)	2 (1.2)		0(0)	2 (1.2)	
	Total	12 (7.3)	152 (92.7)		1 (0.6)	163(99.4)	
Sex	Male	1 (0.6)	50 (30.5)	0.077	0(0)	51 (31.1)	0.500
	Female	11 (6.7)	102 (62.2)		1 (0.6)	112 (68.3)	
	Total	12 (7.3)	152(92.7)		1(0.6)	163 (99.4)	
**LGAs	Ife Central	6 (3.7)	63 (38.4)	0.478	0(0)	69 (42.1)	0.232
	Ife East	4 (2.4)	38 (23.2)		1 (0.6)	41 (25)	
	Ife North	2 (1.2)	51 (31.1)		0(0)	53 (32.3)	
	Total	12 (7.3)	152 (92.7)		1 (0.6)	163 (99.4)	
Health facility	Primary HC	11 (6.7)	96 (58.5)	0.135	0(0)	107 (65.2)	0.359
	Secondary HC	0 (0)	3 (1.8)		0(0)	3 (1.8)	
	Private facility	1 (1.2)	53 (32.3)		1 (0.6)	53 (32.3)	
	Total	12 (7.3)	152 (92.7)		1 (0.6)	163 (99.4)	
Month of Sample collections	January	1 (0.6)	32 (19.5)	*0.023	0(0)	33 (20.1)	0.734
	March	1 (0.6)	35 (21.3)		1	35 (21.3)	
	April	0 (0)	12 (7.3)		0(0)	12 (7.3)	
	August	2 (1.2)	3 (1.8)		0(0)	5 (3.1)	
	September	0(0)	3 (1.8)		0(0)	3 (1.8)	
	November	5 (3.1)	26 (15.9)		0(0)	31 (18.9)	
	December	3 (1.8)	41 (25)		0(0)	44 (26.8)	

* Statistically significant; ** Local Government Areas

Considering the predisposing factors, occupation of the participants had a statistically significant value more of those who are indoor by 8 pm are more affected by dengue. Further details about the predisposing factors are as shown in table 2.

Table 2: Comparative predisposing factors to dengue and chikungunya

Characteristics		DENV IgM			CHIKV IgM		
		+ve (%)	-ve (%)	pValue	+ve (%)	-ve (%)	pValue
Time Indoor	Around 6pm	3 (1.8)	34 (20.7)	0.690	0(0)	37 (22.6)	0.252
	Around 8pm	6 (3.7)	64 (39.0)		0(0)	67 (40.9)	
	Around 10pm	3 (1.8)	35 (21.3)		1 (0.6)	37 (22.6)	
	No certain	0 (0)	19 (11.6)		0(0)	22 (13.4)	
	Total	12 (7.3)	152 (92.7)		1 (0.6)	163 (99.4)	
Recent Mosquitoes Bite	No	2 (1.2)	23 (14.0)	0.692	0(0)	25 (15.2)	0.790
	Yes	5 (3.1)	93 (56.7)		1 (0.6)	97 (59.2)	
	Not sure	2 (1.2)	19 (11.6)		0(0)	21 (12.8)	
	No response	3 (1.8)	17 (10.4)		0(0)	20 (12.2)	
	Total	12 (7.3)	152 (92.7)		1 (0.6)	163 (99.4)	
Residence infested with Mosquitoes	No	2 (1.2)	34 (20.7)		0(0)	36 (22.0)	
	Yes	7 (4.3)	85 (51.8)		1 (0.6)	91 (55.5)	

	Yes, seasonal	0(0)	16 (9.8)	0.500	0(0)	16 (9.8)	0.752
	No response	3 (1.8)	17 (10.4)		0(0)	20 (12.2)	
	Total	12 (7.3)	152 (92.7)		1 (0.6)	163 (99.4)	
Occupation	Trading	2 (1.2)	52 (31.7)	*0.024	1 (0.6)	53 (32.3)	0.562
	Artisan	4 (2.4)	11 (6.7)		0(0)	15 (9.1)	
	Civil Servant	1 (0.6)	16 (9.8)		0(0)	17 (10.4)	
	Unemployed	5 (3.1)	73 (44.5)		0(0)	78 (47.6)	
	Total	12 (7.3)	152 (92.7)		1 (0.6)	163 (99.4)	
Live close to Stagnant water	Yes	7 (4.3)	47 (28.7)	0.52	1 (0.6)	53 (32.3)	0.152
	No	5 (3.1)	105 (64)		0(0)	110 (67.1)	
	Total	12 (7.3)	152 (92.7)		1 (0.6)	163 (99.4)	
Live close to Dumpsites	Yes	4 (2.4)	46 (28)	0.824	0(0)	50 (30.5)	0.507
	No	8	106		1 (0.6)	113	
	Total	12 (7.3)	152 (92.7)		1 (0.6)	163 (99.4)	

* Statistically significant at 95% CI

DISCUSSION

The study demonstrates the active existence and circulation of Dengue Virus (DENV) and Chikungunya virus (CHIKV) among individuals in three LGAs in Ile-Ife. The seroprevalence of IgM antibodies to CHIKV and DENV are 0.6% and 7.3% respectively are substantial and consistent with reports from Cross River State (Otu *et al*., 2019) and North-central, Nigeria (Ogwuche *et al*., 2023). This report highlights the likelihood of under-recognized burden of arboviral infections in febrile patients being a study not regularly conducted due to the presentation of symptoms similar to endemic malaria. In Awka, Nigeria, a seroprevalence study of dengue IgM comprising 188 participants reported 20.2% (Linda *et al*., 2021). Furthermore, out of 120 serum samples, collected in a rural community in Osun state, screened by Okoror *et al*. (2019), 57.50% tested positive for dengue IgM. The detection of the antibodies to these arboviruses in febrile and apparently healthy individuals underscores the need to improve on the diagnosis of diseases associated with febrile conditions in endemic regions rather than presumptively treating such as malaria, a practice that is common in many parts of the study area and consistent with many African nations (Gebremariam *et al*., 2023). The 7.3% IgM prevalence of dengue in this study implies that dengue virus infections is a component of the burden of febrile diseases in Ile-Ife and its environs. This distribution could be explained by the existence of the mosquito vectors, especially *Aedes aegypti* and *Aedes albopictus*, which have good breeding habitats in tropical climate and in areas where stagnant water and inadequate waste disposal provide proper habitats. These conditions abound in the study area and could be responsible for the vector survival and hence, the incidence reported.

On the other hand, chikungunya virus circulation in Ile-Ife can be said to be currently minimal due to very low prevalence of Chikungunya IgM (0.6%). In a study carried out by Adesina *et al.*, 2017, the authors detected Chikungunya RNA in 3 (1.8%) out of the 165 serum samples screened. However, it is higher in the northern part of Nigeria as Muhammed *et al.* (2023) reported 14 (7.0%) and 18(9.0%) incidence of Chikungunya IgM using Rapid test kit and ELISA respectively. Also, a seroprevalence of Chikungunya virus IgM of 2.5% (N=120) in Ikwerre Local Government Area (LGA), Rivers State, Nigeria (Azuonwu *et al., 2024).* This finding can either suggest a low ratio of continued transmission or the probability that the virus is distributed in amounts less than detectable levels in the general febrile population. The low detection rate can also be due to timing differences in virus circulation as many arboviral outbreaks have a cyclical pattern and this is dependent on the environment, density of vectors, and immunity of human population. These reports show that the prevalence of dengue could be said to be higher than that of chikungunya in Nigeria. The reasons for this may bother on the climate change and environmental, social and infrastructural factors which aid the perpetuation

of the vectors. Viral factors also may not be ruled out as the CHIKV could have also undergone some mutations that enable it to evade detection by the diagnostic/research kits. This is a possibility because evolution studies of the virus has not been given the attention it requires.

Age-related patterns of the dengue epidemiology have been observed to be similar in various studies where young adults tend to constitute a considerable percentage of the infected population (Animasaun *et al.*, 2025). This study reported that dengue IgM was more prevalent in females (6.7%), and the single case of chikungunya was also detected in a woman. This could be affected by social and behavioural aspects that predispose to the mosquito vectors. Females can spend more time in the domestic settings that favour the spread of *Aedes* mosquitoes. But it should be mentioned that the occurrence of dengue and chikungunya IgM antibodies according to gender varies not always in different studies and some studies like Sharma *et al.*, 2022 have reported a higher prevalence in males due to occupational exposure and outdoor activities. Thus, the prevalence among females in this study can be as a result of local environmental and behavioural processes in the study population and it may not be right to make a general statement on the frequency of occurrence of the antibodies. The *Aedes aegypti* are known to be daytime biting mosquitoes that commonly reside and feed both indoors and near human dwellings. Consequently, people, who spend extensive time indoors in places where the mosquito thrives can be exposed to mosquito bites and consequent infection.

The two infections are common pathogens in febrile conditions, but while dengue is more prevalent and widely distributed, chikungunya has a lower prevalence at the time of the study. This trend may not be due to transmission failure but other factors that need to be investigated may be responsible since the vector has enabling habitats in the region. The fact that the prevalence of dengue is higher among adolescents and young adults and is more common among females indicates the existence of certain demographic patterns that can be relevant to the targeted interventions of the public health. Further epidemiological surveillance, capacity to improve diagnosis, and good control on vectors are needed to minimize the spread of arboviral diseases in the area. A larger sample size and molecular epidemiological study would give better insight into this study.

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