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Case Series

# Outbreak of Dengue fever in Edo State, South-South, Nigeria: Case Series

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## Abstract

Dengue fever (DF) remains an emerging but underrecognized public health threat in Nigeria, often misdiagnosed as malaria or other acute febrile illnesses due to overlapping symptoms. This case series documents the first clinically and laboratory-confirmed outbreak of dengue in Edo State, Nigeria, between December 2024 and June 2025. Seven patients were diagnosed using RT-PCR atIrrua Specialist Teaching Hospital, with a mean age of 35 years (IQR: 22-45); four were females. The most common symptoms were general weakness (85.7%), headache (71.4%), and vomiting (71.4%), while fever occurred in only four cases. Geospatial mapping revealed clustering within households and local government areas, suggesting focal transmission, likely driven by urban *Aedes* mosquito breeding. Despite delays in hospital presentation, all patients survived without complications. Our findings present atypical dengue presentations in Nigeria, emerging local transmission, and the urgent need to strengthen surveillance, vector control, diagnostics, and public health awareness to mitigate future outbreaks.

**Keywords:** Nigeria; Dengue fever; Case series; Public health; *Aedes* mosquitoes

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**Quick Response Code:**

## Introduction

Dengue fever (DF) is a major global public health concern in tropical and subtropical nations.[1]Annually, over 400 million cases of DF occur globally, resulting in 22,000 deaths.[2] It is an arthropod-borne viral disease caused by the dengue virus (DENV),a member of the family *Flaviviridae* and the genus *Flavivirus*. Primarily, it is transmitted by two species of mosquito: *Aedes aegypti* and *Aedes albopictus*.[3] DENV is an enveloped, positive-sense, single-stranded RNA virus with four distinct serotypes (DENV-1to DENV-4) with 62–67% sequence homology.[4] However, a new serotype (DENV-5) was identified in a 37-year-old patient in Malaysia in 2007, but no further reports have been made since.[5] DENV genotypic classification is based on the patient's immune responses to DF.[6]Homologous DENV serotypes confer protection against secondary infection, whereas heterologous serotypes provide partial protection.[7]

Dengue is transmitted from one person to another through the bite of an infected female mosquito.*Aedes aegypti* is the primary vector of the dengue virus, while the secondary vectors include *Aedesalbopictus*,*Aedes polynesiensis*, *Aedes scutellaris*, and *Aedes niveus*.[2]It is essential to note that Aedes mosquitoes are sensitive to rainfall and temperature, and are primarily active during the day, making control efforts challenging.[8]They are known for their effective vectorial capacity, which includes a high affinity for human blood, high susceptibility to the four DENV serotypes, and high adaptability to urban environments. They breed in and around homes in regular water containers or discarded water-holding vessels.[9]Dengue is a complex disease with a wide range of clinical presentations, ranging from mild illness (such as fever, severe headache, pain behind the eyes, muscle and joint pains, nausea, vomiting, swollen glands, rash) to severe forms like dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS).[7,10]According to the World Health Organization (WHO), DF is endemic in more than 100 countries, with the majority of cases occurring in the Americas, Southeast Asia, Africa, and the Western Pacific. In 2024, over 7.6 million suspected dengue cases were reported to the WHO, including 3.4 million confirmed cases, over 16,000 severe cases, and more than 3,000 deaths.[10]

Factors contributingto the extensive global transmission of dengue include rapid population growth, unplanned urbanisation, increased international travel, agricultural development, and possible global climate change.[3,10]Other contributory factors are ineffective mosquito control measures and limited allocation of resources to public health infrastructure.[3]

The earliest evidence of DF in Africa was recorded in Zanzibar, Tanzania, in 1823 and 1870.[11] Later, in the early 1900s, unsubstantiated outbreaks of dengue fever were reported in several other African nations.[2]More than 20 laboratory-confirmed dengue epidemics have been recorded across 25 African countries between 1960 and 2024, despite many outbreaks never being officially reported.[4,10] In Nigeria, the earliest serologic evidence of DENV was reported in Ibadan during the dry season of 1972.[2,4,12]Since then, serological evidence has been reported in several States across the country.[4]
Additionally, in Nigeria, DF is frequently misdiagnosed and underreported as malaria or typhoid due to similar clinical presentations, leading tounderreporting and underdiagnosis.[7]The recent outbreak, including the ongoing first-ever clinically and laboratory-confirmed outbreak in Edo State, Nigeria, highlights the increasing public health threat posed by dengue.

This case series,therefore, identifies the demographic and clinical patterns of seven early laboratory-confirmed cases, possible transmission routes, and risk factors, serving as a basis for further epidemiological investigation.

## Materials and Methods

We performed acase series of sevenearly laboratory-confirmed cases of DF managed at the Irrua Specialist Teaching Hospital (ISTH) in Edo State, from 29th December 2024 to 14th of June 2025. Irrua

Specialist Teaching Hospital (ISTH) is one of the federal tertiary hospitals in the State. It is designated as a centre of excellence forthe management of Lassa fever and other viral haemorrhagic fevers in Nigeria and West Africa.[13] It also serves as a referral centre for neighbouring Kogi, Delta, and Ondo States.[14]

Records of the cases were obtained from the SORMAS platform through the Edo State Ministry of Health. Edo State is situated in the South-South geopolitical zone of Nigeria. It shares boundaries with Kogi State to the north, Anambra State to the east, Delta State to the south, and Ondo State to the west. It lies within latitudes 5°44' to 7°34'North, and longitudes 05°04' to 6°45' East.[13] Ethical approval was obtained from the Edo State Health Research Ethics Committee (HREC) (Protocol number: HA/737/23/A/080100141).

At ISTH, blood samples were collected from the patients within 1–5 days of symptom onset into EDTA tubes.Thereafter, plasma was separated by centrifugation for RNA extraction using the QIAamp Viral RNA Mini Kit (QIAGEN LLC, Germantown, USA).

The RealStar® Dengue RT-PCR Kit 1.0 (Altona Diagnostics, Germany) was employed on the QIAGEN Rotor-Gene Q system to detect all four dengue virus serotypes with high sensitivity. Fluorescence detection was performed using FAM for dengue RNA and Cy5 for internal control. Results were interpreted as positive if FAM showed a Ct value < 40, negative if only Cy5 was detected without FAM amplification, and invalid if neither channel amplified, indicating possible inhibition or extraction errors.

**Statistical analysis**

The analysis was conducted using Microsoft Excel software version 19 and SPSS version 23. Binary and categorical variables were described using frequency and percentages, while the continuous variables with median and interquartile range. The geographical distribution of DF cases was conducted using ArcGIS Pro, while the residential addresses in Edo were geo-coded using Google Earth to investigate local transmission.

## Results

Seven cases in total presented at ISTH, with onset between December 25, 2024, and June 8, 2025. The median age of the cases was 35 (IQR: 22 - 45) years. Four (57.1%) of the cases were females, and five (71.4%) had tertiary education. Of the cases, three (42.8%) were civil servants, two (28.6%) were engaged in business, and two (28.6%) were students (Table 1).

None of the patients reported travel within one month before infection. The first Case, a 23-year-old male from Ikpoba-Okha LGA, presented on 29 December 2024 (Epi-week 52) with general weakness, abdominal pain, headache, chest pain, nausea, vomiting, sore throat, joint pain, and chills, four days after symptom onset. Subsequent cases emerged between Epi-weeks 21–23, which include a 46-year-old female and a 21-year-old male from the same LGA, followed by a 49-year-old female from Esan West with bleeding. Two females, aged 43 and 16, from the same household in Oredo developed fever, weakness, and bleeding. The final case, a 35-year-old male from Oredo, presented with fever, weakness, and vomiting (Table 1; Figures 1 & 2).

**Table 1:** Demographic, clinical characteristics, and treatment of seven confirmed cases of Dengue fever at Irrua Specialist Teaching Hospital from December 2024 to June 2025, Edo State, Nigeria.

| **Sociodemographic characteristics** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Cases** | **Case 1** | **Case 2** | **Case 3** | **Case 4** | **Case 5** | **Case 6** | **Case 7** |
| **Age** | 23 | 46 | 21 | 49 | 43 | 16 | 35 |
| **Sex at birth** | Male | Female | Male | Female | Female | Female | Male |
| **Town** | Benin | Benin | Benin | Ekpoma | Benin | Benin | Benin |
| **LGA** | Ikpoba-Okha | Ikpoba-Okha | Ikpoba-Okha | Esan West | Oredo | Oredo | Oredo |
| **Education** | Tertiary | Secondary | Tertiary | Secondary | Tertiary | Tertiary | Tertiary |
| **Marital status** | Single | Married | Single | Married | Married | Single | Married |
| **Occupation** | Civil Servant | Business | Student | Business | Civil Servant | Student | Civil Servant |
| **Epidemiological factors** | | | | | | | |
| **Contact with a confirmed case** | No | No | No | No | No | Yes | No |
| **Travel history** | No | No | No | No | No | No | No |
| **Date of illness onset** | 25/12/2024 | 21/05/2025 | 22/05/2025 | 02/06/2025 | 04/06/2025 | 05/06/2025 | 08/06/2025 |
| **Date of hospital Presentation** | 29/12/2024 | 13/06/2025 | 27/05/2025 | 13/06/2025 | 11/06/2025 | 14/06/2025 | 13/06/2025 |
| **Reporting delay (days)** | 4 | 23 | 5 | 11 | 7 | 9 | 5 |
| **Epidemiological Week** | 52 (2024) | 21 | 21 | 23 | 23 | 23 | 24 |
| **Outcome** | Alive | Alive | Alive | Alive | Alive | Alive | Alive |
| **Laboratory timeline (days)** | | | | | | | |
| **Investigation commencement time** | 4 | Same day | 5 | 1 | Same day | Same day | Same day |
| **Specimen transport time** | Same day | Same day | Same day | Same day | Same day | Same day | 1 |
| **Test duration** | Same day | Same day | Same day | Same day | Same day | Same day | Same day |
| **Diagnosis Time (Days)** | 4 | Same day | 4 | 3 | Same day | 1 | 1 |
| **Specimen Type** | Plasma | Plasma | Plasma | Plasma | Plasma | Plasma | Plasma |
| **Malaria test (RDT)** | Not tested | Positive | Positive | Positive | Positive | Positive | Positive |
| **Other haemorrhagic disease test** | YF (negative); LF (negative) | YF (negative); LF (negative) | LF (negative) | LF (negative) | LF (negative) | LF (negative) | LF (negative) |
| **Haematological tests** | | | | | | | |
| **WBC ($10^3$/$mm^3$)** | 9.6 | 3.8 | 9 | 9.2 | 7 | 11 | 16 |
| **RBC ($10^6$/$mm^3$)** | 2.61 | 2.56 | 3.8 | 3.63 | 3.86 | 3.9 | 2.56 |
| **HGB (g/dl)** | 10 | 6.7 | 10.4 | 9.5 | 9.3 | 9 | 8.5 |
| **HCT (%)** | 29.6 | 23 | 33.5 | 31.8 | 31.2 | 26.7 | 24 |
| **PLT ($10^3$/$mm^3$)** | 151 | 329 | 549 | 282 | 191 | 154 | 117 |
| **LYM (%)/ ($10^3$/$mm^3$)** | 29.4/1.8 | 31.8/1.2 | 30.7/2.7 | 34.5/3.1 | 36.1/2.5 | 32/2.8 | 31.1/2.5 |
| **MON (%)/ ($10^3$/$mm^3$)** | 9.3/0.2 | 9.3/0.3 | 8.5/0.7 | 6.6/0.6 | 7.8/0.5 | 9.5/0.4 | 9.8/1.5 |
| **GRA (%)/ ($10^3$/$mm^3$)** | 56.9/2.5 | 58.9/2.3 | 60.8/5.6 | 58.9/5.5 | 56.1/4.0 | 56.8/5.2 | 55.0/4.3 |
| **Biochemical tests** | | | | | | | |
| **Na (mmol/L)** | 140 | 140 | 138 | 135 | 140 | 135 | 136 |
| **K (mmol/L)** | 3.5 | 2.9 | 3.8 | 2.8 | 3.1 | 2.9 | 2.6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Cl (mmol/L)** | 103 | 109 | 107 | 98 | 105 | 103 | 109 |
| **$TCO_2$ (mmol/L)** | 21 | 21 | 25 | 27 | 23 | 23 | 24 |
| **BUN (mg/dL)** | 11 | 11 | 13 | <3 | <3 | 14 | 14 |
| **Cre (mg/dL)** | 1.3 | 1.55 | 1.1 | 0.6 | 0.6 | 0.8 | 1 |
| **iCa (mmol/L)** | 1.18 | 1.17 | 1.18 | 1.11 | 1.08 | 1.07 | 1.06 |
| **T-Pro (g/dL)** | <6.5 | <6.5 | 7.9 | 7.5 | 6.6 | 7.6 | 5.6 |
| **ALB (g/dL)** | 3.3 | 3.2 | 3.8 | 3.6 | 3.2 | 3.6 | 3.6 |
| **T-Bil (mg/dL)** | 0.5 | 0.5 | 1.3 | 1 | 1.2 | 1.3 | 1.2 |
| **GOT (IU/L) (AST)** | 68 | 52 | 103 | 102 | 609 | 108 | 491 |
| **GPT (IU/L) (ALT)** | 82 | 69 | 181 | 278 | 317 | 198 | 264 |
| **Clinical management** | | | | | | | |
| **Admission status** | No | Yes | Yes | Yes | Yes | No | No |
| **Number of days admitted.** | - | 6 | 9 | 11 | 5 | - | - |
| **Referral Facility** | ISTH (MMW) | ISTH (Outpatient) | ISTH (MMW) | ISTH (A&E) | ISTH (A&E) | GREEG LAB | ISTH (A&E) |

***Abbreviations:*** YF-Yellow fever; LF-Lassa fever; RBC-Red Blood Cell Count; WBC-White Blood Cell Count; HGB-Haemoglobin; HCT-Haematocrit; PLT-Platelet; LYM-Lymphocyte; MON-Monocyte; GRA-Granulocyte; ALB-Albumin; iCa-Ionized Calcium; T-Pro-Total Protein; T-Bil-Total Bilirubin; GOT-Glutamate Oxaloacetate Transaminase; GPT-Glutamate Pyruvate Transaminase; A&E-Accident and Emergency; MMW-Male Medical Ward; ISTH-Irrua Specialist Teaching Hospital; LAB-Laboratory

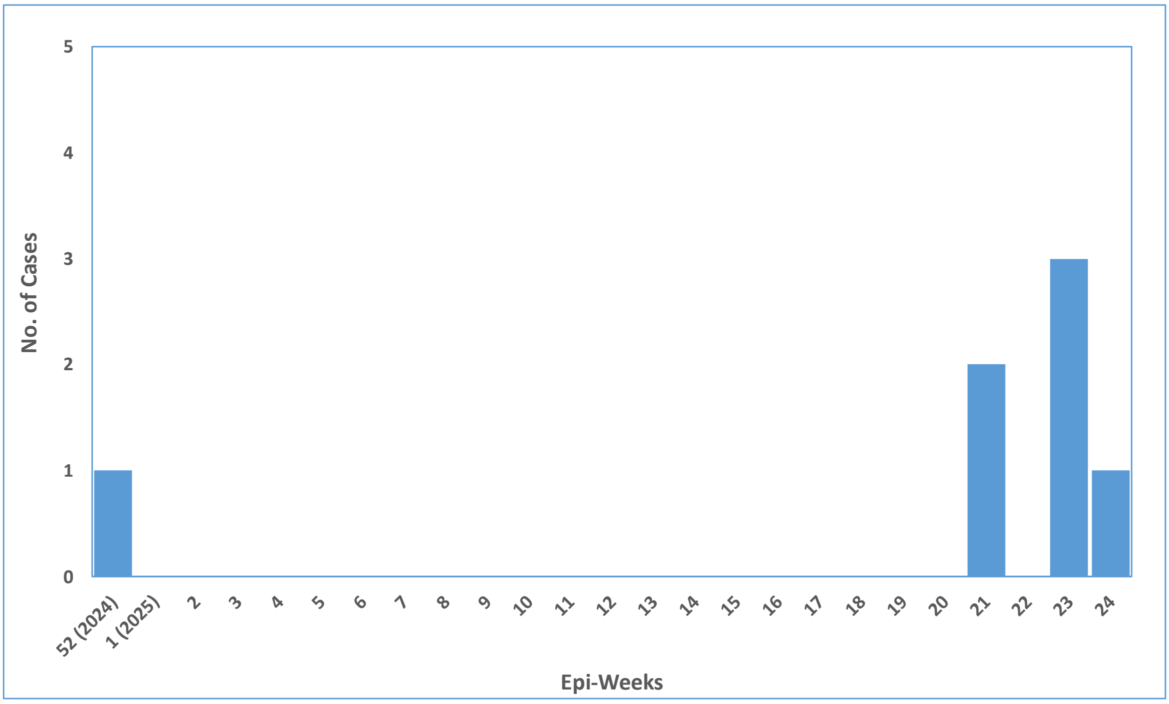


**Figure 1:** Epi-curve of seven confirmed cases of Dengue fever at Irrua Specialist Teaching Hospital from December 2024 to June 2025, Edo State, Nigeria

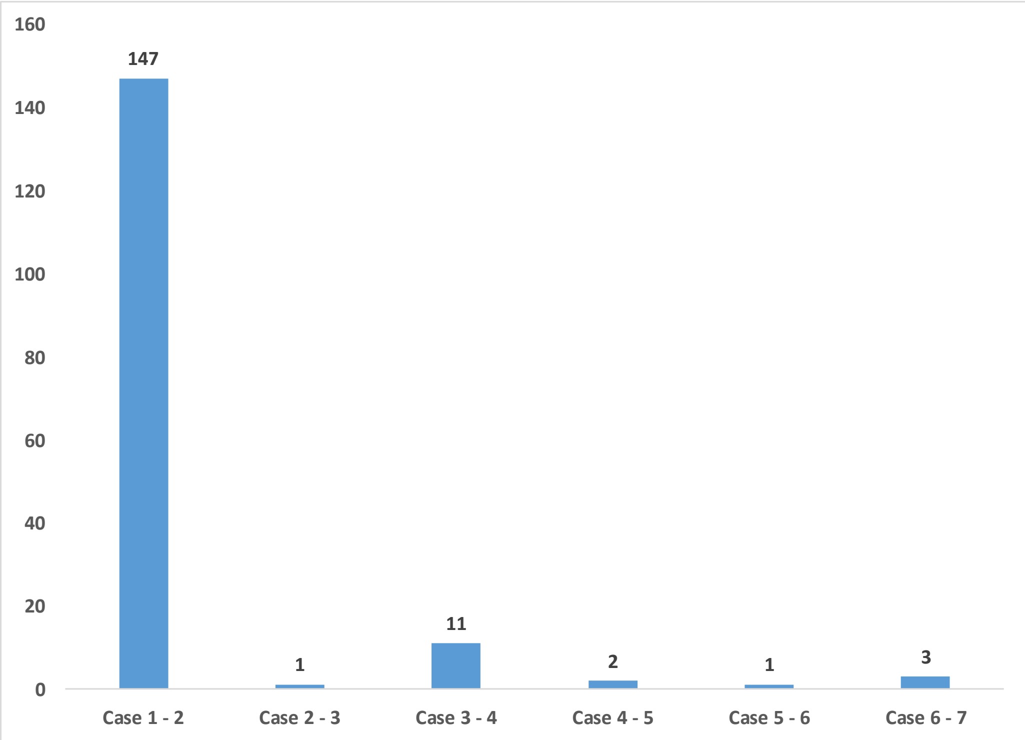


**Figure 2:** Number of days between the incidence of seven confirmed cases of Dengue fever at Irrua Specialist Teaching Hospital from December 2024 to June 2025, Edo State, Nigeria.

**Laboratory Findings**

All samples were tested by RT-PCR and yielded Ct values ≤ 40, confirming DENV infection in all Cases.The clinical course ranged from mild febrile illness to cases exhibiting bleeding and systemic symptoms, and no fatality was recorded. Except for Case 1, who tested negative with the malaria rapid diagnostic test, all other cases tested positive for malaria. Furthermore, all cases tested negative for Lassa fever (Table 1).

The median time from reporting to investigation commencement was within 24 hours (IQR: same day to 2.5 days). The specimen transport time from collection to the laboratory was within 24 hours for Cases 1-6, but one day for Case 7. The test results were released within 24 hours of specimen collection for all the cases. The median time for diagnosis from the day of reporting was one (IQR: 0.5 - 3.5) day (Table 1).

**Clinical presentation of the cases**

All the cases were symptomatic with general weakness (6 of 7), headache (5 of 7), and vomiting (5 of 7) being the most prevalent symptoms reported. Only Case 6had difficulty breathing. Fever was reported in Cases 3, 5,6, and 7 (Table 2).

**Table 2:** Clinical Presentation of seven confirmed cases of Dengue fever at Irrua Specialist Teaching Hospital from December 2024 to June 2025, Edo State, Nigeria

| Clinical presentation | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 | Case 7 |
|---|---|---|---|---|---|---|---|
| Abdominal pain | Red | Green | Red | Green | Green | Green | Green |
| Bleeding from the injection site | Green | Green | Green | Red | Green | Green | Green |
| Bleeding from the gums/mouth | Green | Green | Green | Green | Red | Green | Green |
| Catarrh | Green | Green | Green | Red | Green | Green | Green |
| Chest pain | Red | Green | Green | Red | Green | Green | Green |
| Chills | Red | Green | Red | Green | Green | Green | Green |
| Cough | Green | Green | Red | Green | Green | Red | Green |
| Diarrhoea | Green | Green | Green | Green | Green | Red | Green |
| Difficulty in breathing | Green | Green | Green | Green | Green | Red | Green |
| Fever | Green | Green | Red | Green | Red | Red | Red |
| General weakness | Red | Green | Red | Red | Red | Red | Red |
| Headache | Red | Red | Red | Red | Green | Red | Green |
| Jaundice | Green | Green | Green | Red | Green | Green | Green |
| Joint pain | Red | Green | Red | Green | Green | Green | Green |
| Nausea | Red | Green | Green | Red | Green | Green | Green |
| Passing out coke coloured urine | Green | Red | Red | Green | Green | Green | Green |
| Sore throat | Red | Green | Red | Green | Green | Green | Green |
| Vomiting | Red | Green | Red | Red | Green | Red | Red |

*Red – present, *Green – absent.

**Clinical management**

Cases 2–5 were admitted on the day of hospital presentation. Case 2 was discharged after six days, Case 3 after nine days, Case 4 after eleven days, and Case 5 after five days. Cases 1, 6, and 7 were not admitted (Table 1).

**Geographical distribution of cases**

Ikpoba-Okha LGA and Oredo LGA both recorded three (42.8%) of the cases each, while Esan West LGA had only one case (Table 1). The clustering of cases, especially within households (Cases 5 and 6), within the same LGA (Cases 1, 2, and 3; 5, 6, and 7), suggests possible intra- and inter-household transmission facilitated by local vector breeding (Figure 3).

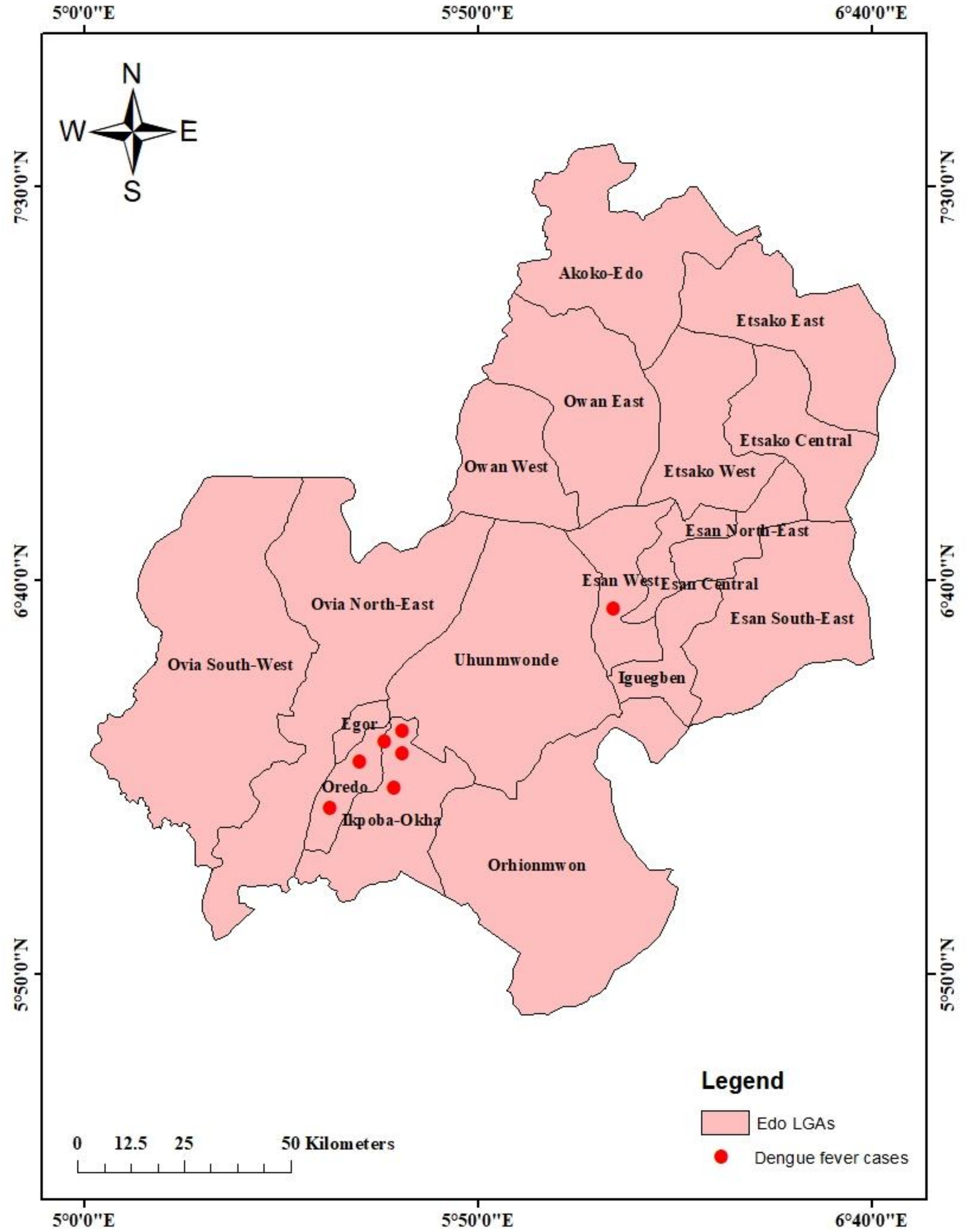


**Figure 3:** Geographical distribution of seven confirmed cases of Dengue fever at Irrua Specialist Teaching Hospital from December 2024 to June 2025, Edo State, Nigeria.

## Discussion

This report presents the clinically and laboratory-confirmed cases of DF in Edo State, Nigeria, after several serological evidence in other parts of the country. Traditionally, DF presents with a sudden onset of high-grade fever (40°C), severe headache, retro-orbital pain, nausea, vomiting, myalgia, and rash.[10]However, the clinical signs and symptoms presented by the cases are diverse, with general weakness (85.7%), headache (71.4%), and vomiting (71.4%) being the most reported. These findings are not commonly emphasised in classical dengue presentations. Additionally, fever was less frequently


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reported (57.1%) than expected. This divergence may reflect regional variations in viral strains or co-infections and highlights the importance of enhancing differential diagnosis protocols in endemic settings.

These signs and symptoms significantly overlap with other febrile conditions like malaria, which is highly common in Nigeria. This overlap makes clinical diagnosis more challenging, a difficulty noted in earlier studies.[7,16] The diversity in symptoms poses a subtle challenge to the development of a high index of suspicion or a suspect case definition for active case search in areas affected by the disease. It further highlights the importance of early detection and laboratory confirmation through methods such as RT-PCR for accurate identification. The high frequency of misdiagnosis or underdiagnosis due to the similarity of symptoms intensifies underreporting, a trend also widely recognised in African countries, where dengue often mimics malaria or typhoid. As previously reported, many patients in Africa, including Nigeria, presenting with fever are classified as having fever of unknown origin or malaria, and they often do not receive a diagnosis, even when they do not respond to antimalarial treatment.[16]

Additionally, the cases exhibited delayed presentation at the hospital, with symptoms reported to have been manifesting for several days (4 - 23),which may be attributed to low awareness of DF symptoms, misdiagnosis as malaria or other febrile illnesses, or limited access to healthcare services. Such delays can hinder timely diagnosis and management, potentially increasing the risk of complications and transmission.[17]

Moreover, the cases' geographical clustering and household proximity suggest that local vector breeding sites significantly contribute to transmission. The presence of cases in different LGAs indicates regional dissemination, likely exacerbated by urbanisation and environmental factors such as rainfall, temperature, and humidity conducive to mosquito proliferation.[18]

The adaptation of *Aedes aegypti* to urban environments, high breeding capacity in discarded containers,tyres, cement tanks, flower pots, and daytime activity,makes control challenging.[19] Importantly, the cases in this study predominantly involved adults within a mid-adult age range, with an average age of 35 years. Specifically, over half of the cases (57.1%) involved individuals under 40 years of age, indicating that young to middle-aged adults constituted the primary affected demographic. Notably, the age range of cases was from 16 to 49 years, indicating that both adolescents and adults are susceptible to dengue infection in this context. This age distribution is similar to a previous study, which suggests that in urban African settings, this group comprises the active workforce, characterized by their outgoing nature and participation in a range of occupations and leisure activitiesthat facilitate transmission.[18]

Although, as noted by an earlier study[4], serological evidence of DF has been reported across several States in Nigeria; however, the first clinically and laboratory-confirmed incidence in Edo State reflects a rising public health threat, compounded by limited diagnostic capabilities in the country.[18]Strengthening surveillance, diagnostic capacity, and public awareness campaigns are essential.

Future studies should involve larger cohorts and a longitudinal design to better understand transmission dynamics and risk factors of the disease.

## Conclusion

This first outbreak of dengue fever in Edo State demonstrates the presence of natural drivers of the disease and a shift in the clinical presentation beyond serological evidence, and the need for a comprehensive public health response.The identification of dengue cases in this region as a result of the emergence of the disease within a previously unrecognized endemic area underscores its expanding geographic distribution and the potential for sustained transmission in new settings.

## Recommendations

To better understand the true burden and transmission dynamics of this potentially emerging threat, there is a pressing need for a nationwide or sentinel surveillance system. This should be complemented by correct identification of clinical features, heightened awareness and preparedness, community education and awareness, effective mosquito vector control, and strengthened diagnostic capacity, including the deployment of multiple affordable, user-friendly, and reliable rapid diagnostic tests (RDTs) at the community level, particularly in remote health facilities. Strategic advocacy and engagement with key stakeholders such as the Federal Ministry of Health (FMOH), Edo State Ministry of Health, and international partners like the WHO will be critical in driving coordinated public health action and research efforts. These are crucial steps toward preventing future outbreaks and mitigating the impact of dengue fever in Edo and other States in Nigeria.

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