



● EDITORIAL

Dengue fever in Sudan: its epidemiological transformation and control efforts over the past decade amidst the ongoing war

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Editorial

Dengue is an arboviral disease caused by dengue virus (DENV) and transmitted by *Aedes* mosquitoes (mainly *Aedes aegypti* and *Aedes albopictus*). The virus belongs to the genus *Orthoflavivirus* (Family: Flaviviridae) and is classified into four distinct but antigenically related serotypes (DENV-1–DENV-4). Although infection with DENV is asymptomatic in most infected persons, the disease can be more profound and can manifest itself as “dengue without warning signs”, “dengue with warning signs”, and “severe dengue”¹. According to the World Health Organization (WHO), more than 14 million cases and more than 11,000 deaths were reported in 2024 worldwide². The disease is currently reported from more than 100 countries, with the highest burden in the Region of the Americas, which accounted for more than 90% of cases in 2024, followed by Asia and Africa². The increase in cases and the spread were attributed to rapid urbanization, water shortage, poor waste management, displacement, and the growing climate sensitivity of transmission². In 2024, the overall reported cases in Sudan exceeded 10,000, with eight deaths². The relatively low number of reported dengue-associated deaths in Sudan should be interpreted cautiously, as fragmented surveillance systems, limited laboratory confirmation, and underreporting may contribute to underestimation of dengue mortality^{3,4}.

Dengue in Sudan was regarded primarily as a disease of the eastern region of Sudan, particularly in big cities such as Port Sudan and Kassala. However, over the past decade, dengue has come to represent a nationwide public health challenge affecting diverse ecological and socioeconomic settings across Sudan with marked spatiotemporal variation. The disease expanded from eastern Sudan and is reported in all regions of Sudan. Dengue transmission is now established in at least 11 Sudanese States, including Khartoum State, with a pooled DENV seroprevalence of 27% reported in a 2020 meta-analysis⁴. In 2023, a major outbreak was reported from North Kordofan, South Kordofan and Red Sea, and followed in 2024–2025 by outbreaks in River Nile, Gezira, Khartoum, and Kassala⁵.

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The virological map of dengue in Sudan has undergone substantial changes over time. Earlier outbreaks were primarily associated with DENV-2 and DENV-3, including the identification of the Cosmopolitan genotype of DENV-2 in Kassala and genotype III of DENV-3 during the 2019 eastern Sudan outbreak⁶. Subsequently, molecular surveillance documented the first detection of DENV-4 in Sudan during outbreaks in Port Sudan and Kassala in 2019⁷, indicating increasing viral diversity; this followed a large outbreak of chikungunya in 2018. More recently, the 2023 Kassala outbreak demonstrated simultaneous circulation of all four dengue virus serotypes⁸. These findings illustrate a shift from sporadic circulation of a limited number of serotypes toward a complex, hyperendemic epidemiological pattern characterized by multiple serotypes.

Dengue in Sudan is transmitted mainly by *Aedes aegypti* and is linked to poor water storage practices and weak control measures⁹. The emergence of an invasive and highly competent dengue vector, *Aedes albopictus*, may be contributing to expanded transmission dynamics and increasing epidemic potential in both urban and rural areas¹⁰.

Diagnosis and clinical management of dengue remain major challenges in Sudan because the disease shares clinical features with other endemic febrile illnesses such as malaria, chikungunya, yellow fever, and other arboviral infections¹¹. Several studies have documented dengue-malaria co-infection, highlighting the risk of misdiagnosis and delayed treatment when clinicians stop investigating after identifying a single pathogen^{12,13}. Laboratory confirmation remains limited by insufficient molecular diagnostic capacity, shortages of reagents, and weak public health laboratory infrastructure^{14,15}. Clinically, Sudanese outbreaks have reported high frequencies of hemorrhagic manifestations, dengue hemorrhagic fever, dengue shock syndrome, thrombocytopenia, and severe disease^{16,17}. Recent surveys among Sudanese physicians also revealed important knowledge gaps regarding recognition of severe dengue, less common symptoms, and effective management and vector control practices¹⁸. These challenges underscore the need for enhanced diagnostic capabilities, clinician training, and integrated laboratory surveillance capable of identifying multiple circulating arboviruses simultaneously¹⁴, guided throughout by the recently published WHO guidelines¹.

In this issue of the *Journal* we publish **Assessment of Platelet Count and Platelet Distribution Width**

(PDW) among Sudanese Patients with Dengue Fever in Kassala State, Sudan, a comparative analytical cross-sectional, laboratory-based study. It documents the degree of thrombocytopenia associated with dengue infection and its severity, and supports platelet monitoring as part of the routine hematological assessment of suspected dengue patients.

The recent expansion and severity of dengue outbreaks in Sudan are closely linked to armed conflict, population displacement, and the collapse of public health infrastructure. Since the onset of the war in April 2023, millions of people have been displaced internally or across borders, often settling in overcrowded areas with inadequate water, sanitation, and healthcare services, reflecting how conflict-driven displacement creates conditions that facilitate the spread of vector-borne diseases^{15,19,20}.

Studies conducted during the conflict found significantly higher dengue infection rates among displaced populations, while reports from conflict-affected States highlighted barriers to healthcare access, insecurity, shortages of preventive supplies, and breakdowns of surveillance systems^{15,21}. Humanitarian camps in Darfur have already experienced dengue outbreaks and dengue-malaria co-infections, illustrating how displacement facilitates disease transmission¹². The destruction of health facilities, disruption of vector control programs, interruptions in disease surveillance, and reduced laboratory capacity have created ideal conditions for dengue expansion^{14,15,19}. Consequently, dengue has become part of a broader complex emergency in which conflict amplifies environmental, social, and health system vulnerabilities that favor arboviral epidemics^{15,19}.

Control efforts in Sudan have largely focused on vector control, surveillance strengthening, public awareness campaigns, and promotion of integrated public health approaches. During the 2010 Port Sudan outbreak, coordinated house inspections, larval source reduction, entomological surveillance, and insecticide spraying significantly reduced *Aedes aegypti* indices and were associated with interruption of transmission²². Multiple studies have subsequently emphasized the importance of routine epidemiological and entomological surveillance, climate-based early warning systems, and community engagement to reduce mosquito breeding sites^{10,23}. Recent investigations have highlighted the value of One Health approaches that integrate human, animal, and environmental surveillance, particularly given the concurrent circulation of multiple

arboviruses^{14,21}. Community knowledge, attitudes, and practices studies conducted during the 2025 outbreak demonstrated generally high awareness but identified persistent misconceptions that require targeted educational interventions²⁴. Nevertheless, persistent weaknesses in laboratory capacity, intersectoral coordination, funding, and health-system resilience continue to limit effective dengue control, particularly under ongoing conflict conditions^{10,21,23}.

In conclusion, dengue in Sudan has evolved from a localized endemic disease into a nationwide complex public health threat characterized by expanding geographic distribution, co-circulation of multiple serotypes, and recurrent outbreaks. Global climate change, concomitant with the ongoing conflict, has further accelerated transmission by disrupting surveillance, vector control, laboratory services, and access to healthcare. A national strategic plan for dengue and arboviruses is highly needed now more than ever. The plan should consider adopting a One Health approach integrating vector control and case management with malaria as the co-existence of *Aedes aegypti* and *Anopheles stephensi* (the invasive vector) and co-infection between dengue and malaria is common in Sudan.

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