

Differentiating malaria from dengue fever by routine hematological parameters in Shendi City, Sudan

Abstract

The recent detection of dengue fever in Shendi City, Sudan, represents a pivotal public health event in a region long dominated by malaria. Following the conflict and population displacement, changing environmental and sanitation conditions have created favorable breeding grounds for *Aedes* mosquitoes. Clinically, dengue and malaria often overlap, posing diagnostic challenges in resource limited healthcare systems. However, simple hematological parameters can offer valuable clues for differentiation. This editorial discusses the implications of dengue's emergence in Shendi, the diagnostic role of routine complete blood counts (CBC), and the urgent need for integrated surveillance and capacity building to mitigate future outbreaks.

Keywords: dengue, malaria, hematology, sudan, misdiagnosis, public health

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Ghanem Mohammed Mahjaf,¹ Leila Mohamed A Abdelgader,¹ Nadir Musa Khalil Abuzeid²

¹Department of Medical Microbiology, Faculty of Medical Laboratory Sciences, Shendi University, Shendi, Sudan

²Department of Microbiology, Faculty of Medical Laboratory Sciences, Omdurman Islamic University, Khartoum, Sudan

Correspondence: Ghanem Mohammed Mahjaf, Department of Medical Microbiology, Faculty of Medical Laboratory Sciences, Shendi University, Shendi, Sudan, Tel 24996680495

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Introduction

The emergence of dengue fever in Shendi City marks a new epidemiological shift in post-war Sudan, where malaria has historically been the predominant vector-borne disease. Recent reports confirming NS1-positive dengue cases suggest that the virus is spreading beyond its traditional foci in eastern Sudan.^{1,2} This spread likely reflects a combination of disrupted public health infrastructure, large-scale population movement, and environmental changes favorable to *Aedes aegypti* and *Aedes albopictus* proliferation.³

Clinicians in Shendi have increasingly encountered febrile illnesses that resemble malaria but respond poorly to antimalarial therapy. In such cases, hematological testing has proven to be a critical—yet underutilized—tool for differentiation. Consistent clinical observations indicate that dengue patients tend to exhibit pronounced thrombocytopenia and leukopenia, while malaria cases are more frequently associated with anemia and relatively stable white blood cell counts. Recognizing these trends in routine CBC results can guide early suspicion of dengue, even before confirmatory serological testing is available. Similar hematological patterns have been reported across Africa and Asia, including in Kassala (Sudan), Ethiopia, and India, underscoring the reliability of these parameters as inexpensive diagnostic indicators.^{4,5,6} Yet, such differentiation remains challenging where automated hematology analyzers or trained laboratory staff are limited. In many primary care centers in Sudan, clinicians still rely almost exclusively on clinical symptoms an approach that often leads to misdiagnosis and inappropriate treatment. The growing overlap between malaria and dengue cases also raises concern about co-infections, which may present with overlapping or atypical hematological profiles.

Studies from eastern Sudan have documented the presence of malaria dengue co-infections among febrile patients, further complicating diagnosis and management.⁵ Such findings highlight the need for careful interpretation and emphasize that CBC results should complement, not replace, confirmatory diagnostic testing. Moreover, the recent identification of *Aedes albopictus* in Sudan, along with the detection of new dengue serotypes such as DENV-4, signals the potential for more severe or recurrent infections in the future.^{3,4} Beyond

diagnostics, the public health implications of dengue's emergence in central Sudan are profound. Integrating dengue screening into existing malaria surveillance systems would enable early outbreak detection and coordinated vector control efforts.

Training general practitioners to interpret hematological warning signs such as a sudden drop in platelet count could improve case recognition at the community level. Furthermore, strengthening local laboratory capacity and ensuring the availability of NS1 and IgM rapid tests in referral hospitals are practical and achievable goals that would bridge current diagnostic gaps.^{2,6} Finally, the broader challenge lies in sustainability. Vector control programs in Sudan have historically been reactive rather than preventive. The reemergence of dengue in new regions like Shendi should prompt policymakers to adopt a more proactive stance, emphasizing environmental management, community education, and cross-sectoral collaboration. In post-conflict settings, such measures are not just medical necessities they are public health imperatives. Similar hematological differentiation challenges have been reported in other African and Asian regions, including Ethiopia, India, and Sri Lanka, where overlapping clinical and laboratory profiles often lead to misclassification of cases.⁴⁻⁶ Moreover, the reliability of CBC-based differentiation may be limited by factors such as co-infections, variations in immune response, and the lack of automated hematology analyzers in peripheral hospitals.

Epidemiology and emerging threats

Dengue fever has historically been confined to eastern Sudan, including Kassala and Port Sudan. Recently, however, Shendi City, situated along the River Nile, has reported confirmed cases, indicating a concerning geographical expansion. Several factors contribute to this emergence, including post-war migration and overcrowding, poor water management and storage practices, and stagnant water providing breeding sites for *Aedes* mosquitoes. Additionally, the appearance of *Aedes albopictus*, a competent vector for dengue virus,³ along with the introduction of new viral serotypes such as DENV-4, increases the risk of severe secondary infections.⁴

Challenges in diagnosis

Dengue is frequently misdiagnosed as malaria, particularly in resource-limited settings where laboratory tests such as NS1, IgM

ELISA, or PCR are often unavailable, and clinicians must rely solely on clinical presentation. The situation is further complicated by co-infections, with studies reporting that 6–10% of febrile patients may simultaneously harbor both malaria and dengue.⁵ Delayed or incorrect diagnosis can result in inappropriate treatment, prolonged illness, and increased viral transmission, highlighting the urgent need for improved diagnostic strategies. In most cases, initial diagnoses were made by general practitioners in primary healthcare centers, whereas confirmatory testing was performed by medical laboratory specialists at Shendi Teaching Hospital.

Based on clinical observations in Shendi City

Clinical observations in Shendi indicated that many patients initially suspected to have malaria were later confirmed as dengue cases. These patients typically exhibited marked thrombocytopenia and leukopenia, while malaria patients showed more pronounced anemia. Such differences in hematological patterns can guide clinicians toward early differentiation in resource-limited settings.

Hematological parameters: a practical differentiation tool

Based on the comparative findings in Shendi City, hematological parameters proved to be a practical and low-cost method for differentiating dengue from malaria. The most consistent features among dengue patients were severe thrombocytopenia and leukopenia, while malaria cases showed prominent anemia and relatively normal white cell counts. Routine complete blood count (CBC) can serve as a practical first-line screening tool, guiding clinicians toward suspected dengue cases even before confirmatory serology or PCR is available. Implementing this approach in Shendi hospitals can reduce misdiagnosis and delayed treatment, allow early detection of outbreaks, and support timely public health interventions to prevent further disease spread.⁶

Conclusion

The emergence of dengue fever in Shendi City is a reminder of the fragility of Sudan's health system amid ongoing humanitarian challenges. Rather than focusing solely on laboratory findings, this event should prompt reflection on the broader systemic issues surveillance gaps, diagnostic inequities, and the urgent need for policy-driven response. Strengthening laboratory capacity, integrating dengue surveillance into malaria programs, and ensuring community-level awareness are crucial steps toward preventing dengue from becoming an entrenched endemic disease in Sudan.

Recommendations

Based on the hematological findings observed in Shendi City, the following measures are recommended:

- I. Routine CBC Screening: All febrile patients should undergo CBC testing before empirical antimalarial treatment, wherever hematology analyzers are available.
- II. Capacity Building: Train general practitioners and laboratory staff to interpret basic hematological patterns suggestive of dengue, especially in areas where automated equipment is unavailable.
- III. Enhanced Diagnostics: Expand NS1 antigen and IgM testing in referral hospitals to confirm dengue cases early.
- IV. Surveillance Integration: Incorporate dengue testing into existing malaria surveillance systems to detect co-infections.
- V. Public Health Education: Increase community awareness of dengue prevention and vector control, especially in post-war and displaced populations.

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Declarations

Ethics approval and consent to participate

Not applicable.

Informed consent

Not applicable.

Consent for publication

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Competing interests

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Data availability

Not applicable.

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