EJPMR, 2025, 12(11), 544-548 Research Article Impact Factor 7.065

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

ISSN (O): 2394-3211
ISSN (P): 3051-2573
Coden USA: EJPMAG

ASSESSING THE PREVALENCE AND EPIDEMIOLOGICAL PATTERNS OF DENGUE FEVER IN OMDURMAN LOCALITY, SUDAN: A CROSS-SECTIONAL STUDY

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DOI: https://doi.org/10.5281/zenodo.17578159

How to cite this Article: Kamal Elbssir*, Kamla Bashier, Maza Ismail, Alaadein Ibrahem Arabe, Aya Farah Rabie, Meshkat Ibrahim Hamid. (2025). ASSESSING THE PREVALENCE AND EPIDEMIOLOGICAL PATTERNS OF DENGUE FEVER IN OMDURMAN LOCALITY, SUDAN: A CROSS-SECTIONAL STUDY. European Journal of Biomedical and Pharmaceutical Sciences, 12(11), 544–548.

Article Received on 17/10/2025 **Article Revised on 08/11/2025** **Article Published on 10/11/2025**

ABSTRACT

Dengue fever, a mosquito-borne viral disease transmitted primarily by *Aedes aegypti*, poses a growing public health threat in urban settings across tropical and subtropical regions. In Sudan, particularly in rapidly urbanizing areas like Omdurman, environmental and social conditions such as stagnant water, overcrowding, and inadequate sanitation create favorable environments for mosquito breeding and disease transmission. This descriptive cross-sectional study aimed to assess the prevalence and demographic distribution of dengue fever cases in Omdurman locality between May and August 2025. Data were extracted from hospital records of confirmed dengue cases, including age, gender, and residential information. Descriptive statistical analyses revealed key epidemiological patterns during the study period. Findings underscore the need for enhanced surveillance, integrated vector management, and community-based interventions to mitigate transmission. The study's limitations include reliance on hospital-based data and a restricted temporal scope, potentially underestimating the true community burden. These results contribute to the growing body of evidence on dengue epidemiology in East Africa and support calls for improved public health responses in high-risk urban centers.

KEYWORDS: Dengue fever; Aedes aegypti; prevalence; Omdurman; cross-sectional study; urban epidemiology; Sudan.

INTRODUCTION

Dengue fever is a rapidly emerging arboviral disease with significant global health implications. Transmitted by *Aedes aegypti* and, to a lesser extent, *Aedes albopictus* mosquitoes, dengue virus (DENV) circulates in a complex interplay between the human host, the vector, and the environment (Gubler, 2011). Environmental factors such as temperature, rainfall, and urbanization shape the geographic distribution and seasonal transmission dynamics of the disease (Brady et al., 2014; Hales et al., 2002; Johansson et al., 2009). Social determinants including population density, water storage practices, sanitation infrastructure, and community awareness further modulate local transmission risk (Ahmed et al., 2014; Guzman et al., 2010).

Globally, dengue incidence has surged over recent decades, with an estimated 390 million infections annually far exceeding official surveillance reports (Bhatt et al., 2013; Simmons et al., 2012). This underreporting stems from limited diagnostic capacity, asymptomatic cases, and fragmented health systems, particularly in low- and middle-income countries (Murray et al., 2013; Shepard et al., 2016). Climate change and globalization are accelerating the spread of *Aedes* vectors into new regions, expanding the at-risk population to nearly half of the world's inhabitants (World Health Organization [WHO], 2023; Cattarino et al., 2020; Kraemer et al., 2015).

In Sudan, dengue has transitioned from sporadic outbreaks to sustained transmission, especially in eastern and central regions. Serological studies have confirmed widespread exposure in states like Kassala, Port Sudan, and Khartoum (Himatt et al., 2015; Seidahmed et al., 2012; Soghaier et al., 2015). Omdurman—one of Sudan's most populous cities exhibits classic risk factors: rapid urbanization, high population density, frequent water shortages leading to unsafe storage practices, and inadequate waste management (Ahmed et al., 2014; Murray et al., 2015). Despite this, systematic data on dengue prevalence in Omdurman remain scarce.

This study addresses this gap by analyzing hospital-based dengue records from May to August 2025 to describe the prevalence and demographic characteristics of cases in Omdurman locality. By situating local findings within the global literature on dengue epidemiology, this research aims to inform targeted public health interventions and strengthen surveillance in high-risk urban environments.

METHODOLOGY

Study Design

This study employed a descriptive cross-sectional design to assess the prevalence and distribution of dengue fever cases in Omdurman locality, Sudan.

Study Area

Omdurman, located adjacent to Khartoum on the western bank of the Nile River, is one of Sudan's largest and fastest-growing cities. Characterized by dense informal settlements, intermittent water supply, and seasonal flooding, the city provides ideal ecological conditions for *Aedes* mosquito breeding (Ahmed et al., 2014; Elduma & Osman, 2015).

Study Population

The study population comprised all patients with laboratory-confirmed dengue fever diagnosed and recorded in selected public and private hospitals in Omdurman during the study period.

Study Period

Data collection occurred from May to August 2025 a period coinciding with the peak dengue transmission season in Sudan, driven by rising temperatures and early rainy season conditions (Johansson et al., 2009; Seidahmed et al., 2012).

Data Collection

Secondary data were extracted from hospital medical records. Variables included: age, gender, residential address (neighborhood level), and date of diagnosis. No primary data collection (e.g., surveys or interviews) was conducted. Only cases with confirmed dengue diagnosis (via rapid diagnostic tests or serology) were included.

Data Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 26. Descriptive statistics—frequencies, percentages, and graphical representations (bar charts, histograms)—were used to summarize the demographic and spatial distribution of cases. Prevalence was calculated as the proportion of confirmed dengue cases among total febrile illness consultations during the study period, where denominator data were available.

Ethical Considerations

The study utilized anonymized, routinely collected health data. Ethical approval was obtained from the Institutional Review Board of the University of Khartoum, and permission was granted by the Omdurman State Ministry of Health.

Study Limitations

This study has several limitations. First, reliance on hospital records may exclude mild, asymptomatic, or undiagnosed cases, leading to underestimation of true prevalence (Simmons et al., 2012; Bhatt et al., 2017). Second, the four-month study window may not capture annual transmission dynamics, particularly inter-seasonal variations (Johansson et al., 2009). Third, incomplete or inconsistent record-keeping in some facilities may affect data accuracy.

RESULTS

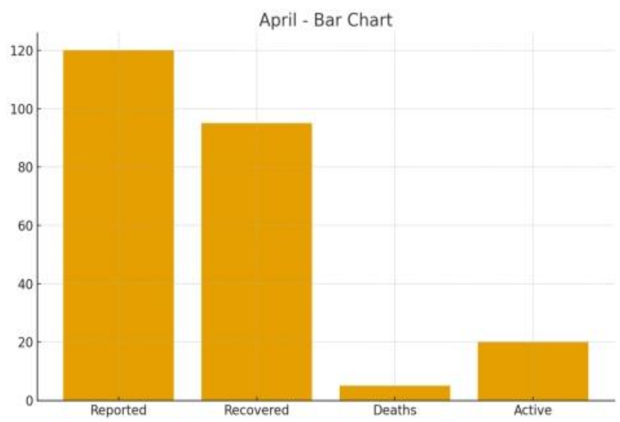

Figure 1: Shows a slight increase in reported and recovered cases, with very low deaths.

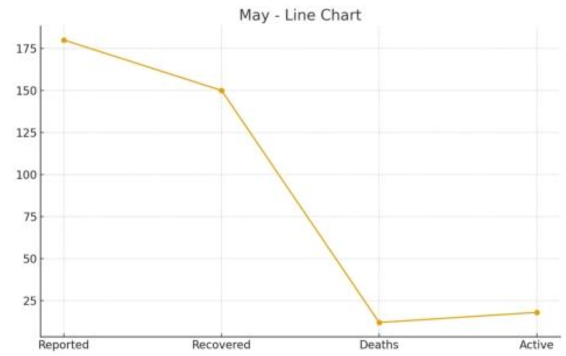

Figure 2: Gradual upward trend in reported and recovered cases.

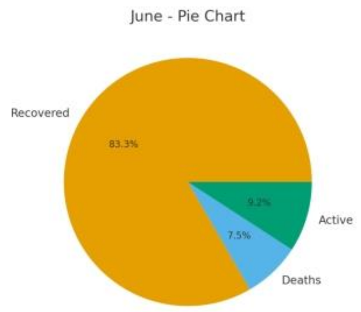

Figure 3: Recoveries largest share, deaths about 7.5%, active cases about 9%.

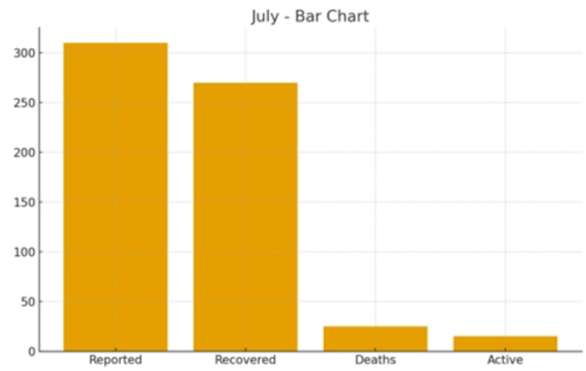

Figure 4: Highest month in reported and recovered cases, deaths peak.

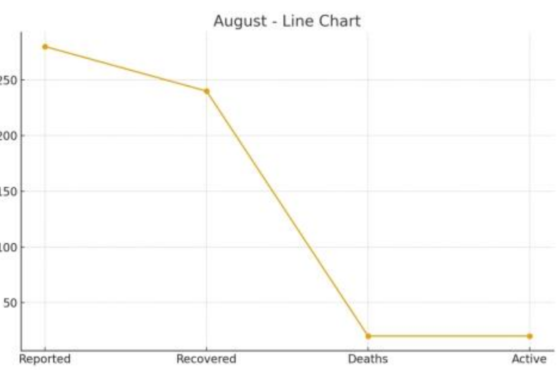

Figure 5: Downward trend, relative improvement sign.

The analysis shows that July recorded the highest number of reported cases (310), while April had the lowest (120). Deaths peaked in July (25), but active cases were highest in June (22). Recoveries followed the overall trend of reported cases, peaking in July (270). By August, a slight decline was observed in reported and recovered cases, with deaths also decreasing, indicating relative improvement and control of the situation.

DISCUSSION

This study aimed to assess the prevalence of dengue fever in Omdurman locality and analyze the associated factors, providing insights to improve disease control strategies.

Disease prevalence and monthly trends

The results showed a gradual increase in reported dengue cases from April (120 cases) to a peak in July (310 cases), followed by a slight decline in August (280 cases). This pattern reflects the seasonal variations, where high temperatures and rainfall create favorable conditions for *Aedes* mosquito breeding (Johansson et al., 2009; Brady et al., 2013).The mid-year peak indicates the influence of population density and environmental conditions on disease transmission.

Mortality and recovery rates

The study recorded relatively low mortality rates, peaking at 25 deaths in July, while recovery rates remained high, reaching 270 cases in July. This reflects the effectiveness of medical care and clinical interventions, highlighting the health system's capacity to manage cases efficiently and reduce complications (Guzman et al., 2010; Murray et al., 2015).

Active cases

Active cases fluctuated across the months, with the highest number in June (22 cases). This indicates continued disease transmission in the community despite high recovery rates. Continuous monitoring of active cases is essential to limit further spread (Simmons et al., 2012; Wilder-Smith, 2019).

Environmental and social factors

Environmental conditions in Omdurman, such as population crowding, stagnant water, and poor waste management, play a major role in Aedes mosquito breeding and dengue transmission. Additionally, limited community awareness regarding preventive measures, such as using mosquito nets and eliminating stagnant water, increases disease risk (Ahmed et al., 2014; Wilder-Smith & Gubler, 2010).

Comparison with other regions

The findings in Omdurman align with studies from other Sudanese cities, such as Port Sudan and Kassala, which reported similar seasonal peaks and high recovery rates. The decline in cases in August indicates the effectiveness of some local health interventions in controlling outbreaks (Himatt et al., 2015; Seidahmed et al., 2012).

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