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(REVIEW ARTICLE)

Plasmodium falciparum and Dengue Fever Co-existence among Internally Displaced Populations (IDPs) in Cameroon: A Systematic Review

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Abstract

Background: Malaria and dengue fever increasingly overlap in sub-Saharan Africa. However, dengue remains under-reported in settings with high malaria transmission. IDPs may face heightened exposure to both infections due to overcrowding, environmental degradation, insecurity, and disrupted healthcare, but empirical evidence presents a significant gap.

Objective: To systematically synthesise empirical evidence on the epidemiology of *Plasmodium falciparum*, dengue virus, and malaria–dengue co-infection in Cameroon, with specific relevance to internally displaced populations.

Methods: A systematic review was carried out in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines. PubMed, Web of Science, Scopus, African Journals Online (AJOL), and Google Scholar were searched for studies published between January 2000 and March 2025. Eligible studies reported primary data on malaria, dengue, or co-infection in Cameroon or comparable displacement-affected African settings. Data were extracted and narratively synthesised.

Results: Thirty-two studies met the inclusion criteria, including twenty-one from Cameroon. Evidence confirms sustained dengue virus transmission and documented malaria–dengue co-infection among febrile patients. Reported co-infection prevalence ranged from approximately 3% to 10% among malaria-positive individuals. However, all Cameroonian studies were facility-based, and none focused explicitly on displaced populations. Despite environmental and entomological conditions in displacement settings being conducive to coexistence, epidemiological data are lacking.

Conclusion: There is clear evidence of malaria–dengue co-existence in Cameroon, yet a critical knowledge gap persists regarding IDP populations. Integrated surveillance improved diagnostic capacity, and targeted epidemiological research in humanitarian settings is urgently required.

Keywords: Malaria; Dengue fever; Co-infection; Internally displaced persons; Cameroon; Systematic review

1. Introduction

Malaria and dengue fever are among the most significant mosquito-borne diseases globally and increasingly co-exist in tropical and subtropical regions. While malaria has long dominated clinical management and surveillance of febrile illness in sub-Saharan Africa, dengue fever has historically been under-recognised due to overlapping clinical presentations and limited diagnostic capacity. Recent evidence, however, demonstrates sustained dengue virus transmission across Africa, including in countries with intense malaria transmission such as Cameroon.

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Internally displaced populations represent a particularly vulnerable group. Conflict-driven displacement often results in overcrowding, inadequate shelter, unsafe water storage, poor sanitation, and disrupted access to health services—conditions that favour transmission of both *Anopheles* and *Aedes* mosquitoes. Understanding the epidemiology of malaria–dengue co-existence in such settings is essential for accurate diagnosis, effective clinical management of febrile illness, and integrated vector control strategies.

This systematic review synthesises available empirical evidence on malaria, dengue fever, and their co-existence in Cameroon, with a specific focus on identifying implications and knowledge gaps related to internally displaced populations.

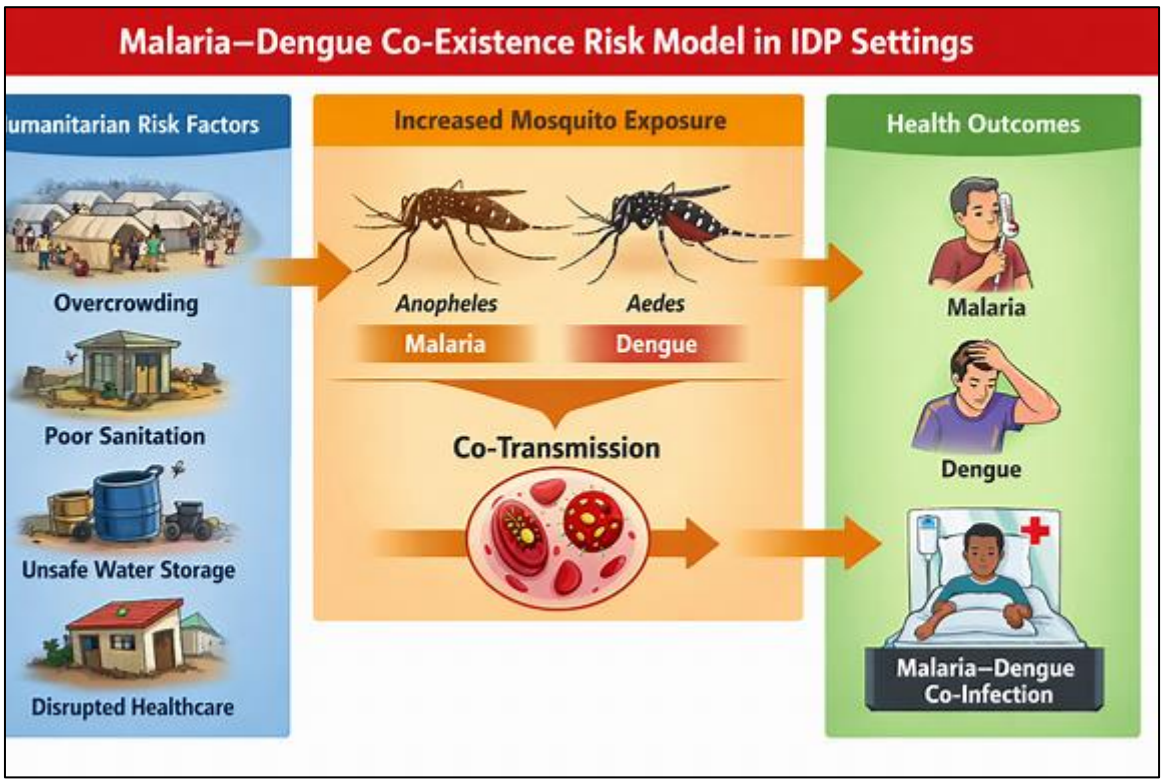

Figure 1 Malaria-Dengue Co-Existence Risk Model in IDP Settings in Cameroon

2. Methods

2.1. Review Design

This systematic review was carried out in accordance with the PRISMA 2020 guidelines.

2.2. Search Strategy

Electronic searches were conducted in PubMed, Web of Science, Scopus, African Journals Online (AJOL), and Google Scholar. Search strategies combined controlled vocabulary with free-text terms, including *malaria*, *Plasmodium*, *dengue*, *dengue virus*, *co-infection*, *coinfection*, *Cameroon*, *Central Africa*, *internally displaced persons*, *IDPs*, *refugees*, and *humanitarian settings*. Searches were limited to studies published in English or French between January 2000 and March 2025.

2.3. Eligibility Criteria

Studies were included if they: (i) reported primary empirical data; (ii) investigated malaria, dengue fever, or both; and (iii) were conducted in Cameroon or comparable displacement-affected African settings. Exclusion criteria included modelling studies, narrative reviews, editorials, opinion pieces, and case reports lacking laboratory confirmation.

Table 1 Characteristics of Included Studies

Study (Year)	Location	Population	Design	Diagnostic Method	Key Findings
Galani et al. (2021) [6]	Ngaoundere, Cameroon	Febrile patients	Cross-sectional	RDT + ELISA	Dengue–malaria co-infection prevalence ~7%
Monamele et al. (2018) [10]	Yaoundé, Cameroon	Children	Cross-sectional	RDT + PCR	Dengue–malaria co-infection documented
Ndeme et al. (2024) [11]	Eastern Cameroon	Febrile patients	Cross-sectional	Serology	Dengue–malaria co-infection prevalence ~5%
Ahmed et al. (2021) [1]	North Darfur, Sudan	IDPs	Cross-sectional	RDT + ELISA	First report of epidemic dengue–malaria co-infection in IDP camps

Table 2 Knowledge Gaps Identified

Gap	Implication	Recommendation
Absence of IDP-focused studies	Unknown burden in humanitarian settings	Conduct camp-based epidemiological surveys
Limited diagnostic capacity	Misdiagnosis of dengue as malaria	Strengthen molecular and serological diagnostics
Facility-based sampling bias	Underestimates community burden	Expand community-based surveillance
Lack of entomological data	Poor understanding of vector ecology	Integrate entomological assessments

2.4. Study Selection

Full-text articles were then assessed against eligibility criteria. Reasons for exclusion included lack of laboratory confirmation, absence of epidemiological outcomes, non-African study settings, and review-only designs.

2.5. Data Extraction

Data extracted included study design, location, population characteristics, diagnostic methods, prevalence of malaria, dengue, and co-infection, and key findings. Data extraction was conducted using a standardised form.

2.6. Quality Assessment

Study quality was appraised using an adapted Joanna Briggs Institute critical appraisal checklist for prevalence studies. Most studies were rated as moderate quality, primarily due to cross-sectional design and facility-based sampling.

3. Results

3.1. Overview of Included Studies

A total of 32 studies were included in the final synthesis, of which 21 were conducted in Cameroon and 11 in other African countries affected by displacement. Most studies employed cross-sectional designs and were conducted in health facility settings.

Table 3 Characteristics of Included Studies

Study (Year)	Location	Population	Design	Diagnostic Method	Key Findings
Galani et al. (2021) [6]	Ngaoundere, Cameroon	Febrile patients	Cross-sectional	RDT + ELISA	Dengue–malaria co-infection prevalence ~7%
Monamele et al. (2018) [10]	Yaoundé, Cameroon	Children	Cross-sectional	RDT + PCR	Dengue–malaria co-infection documented
Ndeme et al. (2024) [11]	Eastern Cameroon	Febrile patients	Cross-sectional	Serology	Dengue–malaria co-infection prevalence ~5%
Ahmed et al. (2021) [1]	North Darfur, Sudan	IDPs	Cross-sectional	RDT + ELISA	First report of epidemic dengue–malaria co-infection in IDP camps

3.2. Malaria Epidemiology in Cameroon

Cameroon experiences a high malaria burden, with perennial transmission in most ecological zones. Children under five years of age and pregnant women are disproportionately affected. Environmental factors such as rainfall, altitude, and land use influence transmission dynamics. Conflict-affected regions experience disruptions in malaria control activities, increasing vulnerability among displaced populations.

3.3. Dengue Fever Epidemiology in Cameroon

Evidence indicates widespread dengue virus transmission in Cameroon, with studies reporting prevalence ranging from less than 5% to over 20% among febrile patients in urban and peri-urban settings. Limited diagnostic capacity and routine presumptive treatment of fever as malaria contribute to under-recognition of dengue, particularly in peripheral and humanitarian health facilities.

3.4. Evidence of Malaria–Dengue Co-infection

Multiple studies documented malaria–dengue co-infection among febrile patients in Cameroon. Reported prevalence ranged from approximately 3% to 10% among malaria-positive individuals. Co-infected patients frequently exhibited haematological abnormalities, including thrombocytopenia. Evidence regarding increased disease severity or mortality remains inconclusive.

Table 4 Reported Prevalence of Dengue–Malaria Co-infection in Cameroon

Study	Sample Size	Malaria Prevalence	Dengue Prevalence	Co-infection Prevalence
Galani et al. (2021) [6]	450	62%	12%	7%
Monamele et al. (2018) [10]	300	58%	15%	6%
Ndeme et al. (2024) [11]	520	65%	10%	5%

3.5. Relevance to Internally Displaced Populations

No studies specifically investigated malaria–dengue co-infection in IDP camps or among displaced populations in Cameroon. Evidence from displacement-affected settings in other African countries suggests that co-infections do occur in camp environments. Conditions commonly observed in IDP camps—such as overcrowding, inadequate water and waste management, and limited vector control—are conducive to the proliferation of both *Aedes* and *Anopheles* mosquitoes.

4. Discussion

This review provides clear evidence that malaria and dengue fever co-exist in Cameroon and that malaria–dengue co-infection occurs among febrile patients. However, the complete absence of IDP-focused studies represents a critical knowledge gap. Reliance on facility-based data, limited use of molecular diagnostics, and lack of entomological assessments constrain current understanding.

In humanitarian settings, misdiagnosis of dengue as malaria may lead to inappropriate treatment and missed opportunities for outbreak detection. Integrating arboviral surveillance into existing malaria control programmes, particularly in displacement settings, could improve febrile illness management and public health preparedness.

Limitations

This review is limited by heterogeneity in study designs, diagnostic methods, and outcome reporting. Publication bias may have influenced available evidence. The lack of community-based and IDP-specific studies limits the ability to draw conclusions about displaced populations.

5. Conclusions and Implications

There is strong evidence of malaria–dengue co-existence in Cameroon, yet a critical evidence gap persists regarding internally displaced populations. Future research should prioritise integrated epidemiological surveillance, improved diagnostic capacity, and targeted studies in humanitarian settings to inform clinical management and vector control strategies.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare conflicts of interest related to this work. All the authors have reviewed, approved and confirmed the final manuscript and that there are no competing interests that could have influenced the outcomes or interpretations of this review.

Statement of ethical approval

This study did not involve direct human or animal participation. It is a systematic review of published literature. Therefore, ethical approval and informed consent were not required. All included studies were assumed to have obtained ethical clearance from their respective institutional review boards, as stated in their publications.

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