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Letter to the Editor

Anopheles stephensi and the impending challenge to malaria eradication in Africa

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Dear Editor,

Malaria remains a formidable global health threat [1]. Despite significant progress in malaria eradication efforts, the emergence of *Anopheles stephensi* in Africa poses a critical challenge to the ongoing initiatives [2]. This mosquito species, traditionally found in Asia, has demonstrated adaptability to African environments, threatening to reverse the gains made in malaria control. While many African countries have made strides in controlling malaria, achieving elimination remains a challenge due to identifiable steps and unpredictable progression.

Anopheles stephensi, traditionally an Asian malaria vector, has become an alarming threat in Africa. Its unique characteristics, such as thriving in urban areas, resistance to pesticides, and laying eggs in artificial water sources, set it apart from other vectors [3]. The unexpected outbreak in Ethiopia in 2023 highlighted the urgency of addressing this invasive mosquito's presence [3]. The genetic and immunological factors of *Anopheles stephensi*, including changes in the APL1 immune factor, contribute to its adaptability [4]. Additionally, the mosquito's ecological and behavioral characteristics, such as breeding in urban water storage tanks, influence its potential as a malaria vector.

Limited knowledge about *Anopheles stephensi's* bionomics hampers eradication efforts. Challenges include identifying saline-tolerant larvae, establishing identification keys, overcoming insecticide resistance, and addressing climate change implications. Additionally, the lack of centralized data and varying political will across affected countries complicates surveillance.

Climate and environmental factors, including temperature preferences, play a pivotal role in *Anopheles stephensi's* emergence. Its ability to adapt to urbanization and exploit human-built water storage facilitates its spread. Additionally, rising temperatures and changing precipitation patterns influence the mosquito's abundance. Studies suggest that *Anopheles stephensi* could increase annual P. falciparum malaria cases by 50% if strategic interventions are not implemented [3, 4]. Mapping thermal transmission suitability using satellite imagery becomes crucial for predicting its spread and informing targeted interventions. Current vector control strategies, recommended by WHO, may need augmentation to combat *Anopheles stephensi* effectively. Challenges include limited surveillance, human behavior influencing transmission, and the need for tailored control measures in different communities. Resistance to conventional treatments and climate change further complicate control efforts.

Collaborative efforts are essential for tackling the *Anopheles stephensi* invasion. Countries like Mauritius and the United States have employed a One Health approach and multi-state collaboration, respectively, to strengthen surveillance and control. However, technical limitations and varied political will among affected countries remain challenges. The emergence of *Anopheles stephensi* in Africa poses a multifaceted challenge to malaria eradication efforts. Understanding its profile, characteristics, and the factors contributing to its spread is crucial for devising targeted control strategies. Collaborative international efforts, coupled with ongoing research, are imperative to address the complex dynamics of this invasive vector and ensure continued progress in the fight against malaria in Africa.

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Consent for publication

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Gbolahan Olatunji: Writing – review & editing, Writing – original draft, Conceptualization. **Emmanuel Kokori:** Writing – review & editing, Writing – original draft. **Julia Mimi Kwape:** Writing – review &

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editing, Writing – original draft, Conceptualization. **Doyin Olatunji:** Writing – review & editing, Writing – original draft. **Chidera Stanley Anthony:** Writing – review & editing, Writing – original draft. **Ikponmwosa Jude Ogieuhi:** Writing – review & editing, Writing – original draft. **Jessica Uchechi Damian:** Writing – review & editing, Writing – original draft. **Israel Charles Abraham:** Writing – review & editing, Writing – original draft. **Stephen Chukwuemeka Igwe:** Writing – review & editing, Writing – original draft. **Oreoluwa Alabi:** Writing – review & editing, Writing – original draft, Conceptualization. **Nicholas Aderinto:** Writing – review & editing, Writing – original draft, Conceptualization.

Declaration of competing interest

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List of abbreviations

WHO	World Health Organization
NMCP	National Malaria Control Program
P. falciparum	Plasmodium falciparum
APL1	Anopheles Plasmodium-responsive leucine-rich repeat 1
US	United States
GIS	Geographic Information System
DNA	Deoxyribonucleic Acid

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Gbolahan Olatunji, Emmanuel Kokori
Department of Medicine and Surgery, University of Ilorin, Ilorin, Nigeria

Julia Mimi Kwape
University of Botswana School of Medicine, Botswana

Doyin Olatunji
Department of Health Sciences, Western Illinois University, USA

Chidera Stanley Anthony
University of Calabar, Calabar, Nigeria

Ikponmwosa Jude Ogieuhi
Siberian State Medical University, Tomsk, Russia

Jessica Uchechi Damian
Dept of Public Health, University of Venda, South Africa

Israel Charles Abraham, Stephen Chukwuemeka Igwe
Department of Medicine and Surgery, University of Ilorin, Ilorin, Nigeria

Oreoluwa Alabi
Nigerian Institute of Medical Research, Nigeria

Nicholas Aderinto*
Department of Medicine and Surgery, Ladoke, Akintola University Teaching Hospital, Ogbomoso, Nigeria

* Corresponding author. Department of Medicine and Surgery, Ladoke Akintola University of Technology, PMB 5000, Nigeria.
E-mail address: Nicholasoluwaseyi6@gmail.com (N. Aderinto).