



# Confronting *Plasmodium knowlesi*: Challenges and Strategies in Malaria Healthcare

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Editorial

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## Keywords

*Plasmodium knowlesi*; Malaria; Infection; Disease; Epidemiology

## Abbreviations

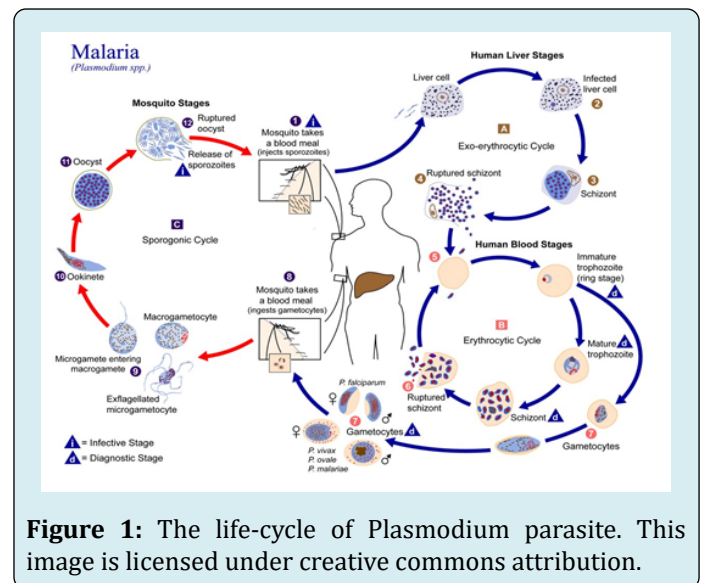
ACT: Artemisinin Combination Therapy; NGS: Next-Generation Sequencing; RDTs: Rapid Diagnostic Tests  
PCR: Polymerase Chain Reaction

## Editorial

Malaria remains a global health concern, causing 300-500 million infections and 1.5-2.7 million deaths each year, primarily among young children in sub-Saharan Africa, Southeast Asia, and Latin America. The disease is not easy to prevent due to its complexity and drug resistance. *Plasmodium knowlesi*, which infects both humans and macaques, complicates diagnosis and treatment with its unique 24-hour fever cycle and potential for severe symptoms. *Plasmodium knowlesi* is especially problematic in areas where humans and macaques interact, often misdiagnosed as *Plasmodium malariae*, although PCR methods have improved accuracy. Early detection and artemisinin-based combination therapies (ACTs) are crucial, with severe cases requiring urgent medical care. In Malaysia, *Plasmodium knowlesi* is the leading cause of malaria, impacting forest workers and underscoring the need for education and mosquito control. Despite advances in molecular tools and genome sequencing, malaria still leads to around half a million deaths annually.

Malaria has a profound impact on global health and economies. The disease is prevalent in sub-Saharan Africa, Southeast Asia, and Latin America, affecting 2.4 billion

individuals. Vaccine development has seen progress. *Plasmodium knowlesi*, which can infect humans and macaque monkeys, is characterized by a unique 24-hour fever cycle and may cause severe conditions such as acute respiratory distress and kidney failure. Addressing malaria, including *Plasmodium knowlesi*, necessitates improved diagnostics, effective treatments, ongoing vaccine research, mosquito control, and public health education. Continuous research, robust health initiatives, and global collaboration are crucial for eradication efforts (Figure 1) [1].



*Plasmodium knowlesi*, a malaria parasite found in long-tailed and pig-tailed macaques, can be transmitted to humans, particularly in regions where people live near these primates. The similarity between *Plasmodium knowlesi* and *Plasmodium malariae* has made accurate diagnosis difficult.



However, advanced molecular detection methods such as PCR have significantly improved diagnostic precision. Early detection and treatment with antimalarial medications, especially artemisinin-based combination therapies (ACTs), are crucial for effective disease healthcare [2].

*Plasmodium knowlesi*, the fifth recognized human malaria parasite, poses a significant health threat in Southeast Asia. Advancements in PCR technology have enabled accurate diagnosis, correcting previous misidentifications as *Plasmodium malariae*. The high number of cases and occasional fatalities have led to increased research efforts. The parasite is transmitted from macaques to humans through Anopheles mosquitoes, complicating control efforts. A challenge is the need for rapid diagnostic tests (RDTs), especially in rural areas. Developing RDTs and studying potential human-to-human transmission is crucial for improving prevention strategies. A comprehensive approach that includes diagnostics, transmission research, and effective prevention measures is essential to control and mitigate the impact of knowlesi malaria in Southeast Asia [3,4].

*Plasmodium knowlesi*, a zoonotic parasite found in Southeast Asia, is hard to diagnose due to its similarity to *Plasmodium malariae*, leading to potential misdiagnosis and treatment delays. Accurate and early diagnosis is critical. Artemisinin combination therapy (ACT) effectively treats uncomplicated cases, whereas severe cases need intravenous artesunate to reduce parasite load and decrease mortality rates. Timely treatment and supportive care, such as paracetamol, are essential to prevent complications and enhance patient outcomes [5,6].

In at least 10% of cases, *Plasmodium knowlesi* malaria can escalate to a severe condition, initially showing

symptoms including difficulty breathing, abdominal pain, and vomiting. The rapid replication of the parasite can lead to acute kidney injury, jaundice, shock, and respiratory distress, necessitating immediate medical attention. Although coma or severe anemia is rare, vigilance remains essential. The parasite's 24-hour replication cycle causes daily fever spikes and symptoms that range from mild flu-like illness to severe conditions. Uncomplicated cases are generally treated with chloroquine, while severe cases require artemisinin-based combination therapy (ACT). Ongoing research is vital for improving diagnostics, treatment, and preventive measures, including mosquito control and vaccine development. *Plasmodium knowlesi* is a disease demanding prompt intervention and continuous research efforts [7,8].

In Malaysia, *Plasmodium knowlesi* is the primary cause of malaria, affecting both travelers and residents in Southeast Asia. Those at risk include individuals working in dense forests, such as farmers, hunters, and loggers, resulting in a higher prevalence among adult males in these professions. Prevention strategies focus on education, protective practices, and mosquito control in forested regions. Globally, malaria is responsible for around half a million deaths annually, predominantly in tropical and subtropical areas. Six *Plasmodium* species cause malaria, each presenting distinct challenges for control. Advances in molecular tools, next-generation sequencing (NGS), and bioinformatics have greatly improved our understanding and its healthcare. The sequencing of the *Plasmodium falciparum* genome was a significant milestone, providing valuable insights into the parasite's biology and drug resistance. Continued investment in these technologies is crucial for effective malaria control and eradication, enabling targeted interventions and the development of new treatments and vaccines (Figure 2) [9,10].



**Figure 2:** The Map of Southeast Asia. This image is licensed under Creative Commons Attribution.

Malaria remains a major global health threat, particularly in tropical and subtropical regions, severely impacting economies and communities. Despite progress in vaccines and diagnostics, the disease's complexity and drug resistance hinder prevention and treatment. *Plasmodium knowlesi* poses additional challenges due to its zoonotic nature and diagnostic difficulties. Effective combat strategies should enhance diagnostic accuracy, develop treatments, and implement comprehensive prevention measures, including mosquito control and public health education. Continuous research and global collaboration are essential to address drug resistance and advance eradication efforts. A multifaceted approach combining these strategies is crucial to reduce malaria's global burden and achieve health goals [11-34].

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