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At the forest edge, malaria never really left Borneo

Borneo Post (KK), Malaysia



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MALAYSIA tells a powerful success story when it comes to malaria. Indigenous transmission of human malaria species has been driven to zero since 2018, placing the country close to elimination. Yet in Sabah and Sarawak, that success sits alongside a quieter and more complex reality. Malaria did not disappear. It changed form, and it concentrated itself in places where the forest meets human life.

Globally, malaria remains one of the most significant infectious disease threats, with an estimated 282 million cases and 610,000 deaths reported in 2024. While the burden remains highest in Africa, Borneo tells a different story. In Malaysia, the remaining malaria problem is now overwhelmingly zoonotic, driven by *Plasmodium knowlesi*, a parasite transmitted from macaques to humans through mosquito vectors.

The numbers carry a weight that is often underestimated. Malaysia recorded 3,629 malaria cases and 16 deaths in 2023, followed by 2,384 cases and 3 deaths in 2024. Sabah and Sarawak alone accounted for roughly three quarters of that burden, placing Borneo at the centre of the Malaysia's malaria burden. More strikingly, 1,927 *P. knowlesi* cases were reported in 2024, representing almost 89 % of all reported *knowlesi* cases globally.

This means that Sabah and Sarawak are not just local hotspots. Malaysia is now the global centre of reported *knowlesi* malaria, with Sabah and Sarawak carrying most of that burden. Malaysia can be described as malaria free in the traditional sense, yet malaria continues to persist in a different form. The distinction matters. Elimination of human malaria does not mean the disease is gone. It means the problem has shifted into a more complex ecological space where human-centred interventions alone are no longer sufficient.

What makes *P. knowlesi* different is not only its origin, but its ecology. The parasite circulates naturally among macaques, with mosquitoes acting as vectors that bridge the gap between wildlife and humans. Transmission occurs at the forest edge, in plantations, and in areas where human activity intersects with fragmented ecosystems. This exposure is embedded within livelihoods.

In Sabah and Sarawak, that exposure is part of everyday life. Plantation workers, farmers, and communities living near forest fringes are routinely placed within this transmission zone. Development has increased contact between humans, macaques, and mosquito vectors. Deforestation, agricultural expansion, and settlement patterns have created environments where zoonotic transmission is not only possible, but sustained.

The science behind this shift has been decisive. Molecular studies revealed that many infections previously identified as *P. malariae* were in fact *P. knowlesi*. At the same time, entomological research demonstrated that key mosquito vectors in Borneo do not behave in ways that align neatly with traditional control strategies. Many bite outdoors or during the early evening, before individuals are protected by bed nets. This reduces the effectiveness of interventions that were designed for indoor, late-night transmission.

Clinically, the implications are serious. *P. knowlesi* has a rapid replication cycle, allowing parasitaemia to rise quickly within a short period. Patients may present with what appears to be a mild febrile illness, only to deteriorate rapidly if diagnosis is delayed. *Knowlesi* malaria can deteriorate rapidly, and studies from East Malaysia suggest severe disease in about 6 to 9 % of symptomatic cases.

Malaria is transmitted through the bite of an infected *Anopheles* mosquito, often in settings where people live or work near forested and plantation areas. In Malaysia, particularly in Sabah and Sarawak, zoonotic malaria such as *Plasmodium knowlesi* is

more common among individuals involved in agricultural and forest-related activities. Symptoms typically develop within days to weeks after exposure and may include fever, chills, headache, body aches, and fatigue, which can worsen rapidly if not treated early. Prevention focuses on reducing mosquito bites through the use of insecticide-treated nets, protective clothing, and minimising outdoor exposure during peak biting periods.

Ministry of Health guidelines emphasise early diagnosis and prompt treatment with artemisinin-based combination therapy, and anyone with fever and recent exposure to high-risk areas should seek immediate medical attention. For individuals travelling to or working in high-risk forested areas, medical advice on malaria prophylaxis may be considered, although prevention in Malaysia largely focuses on reducing mosquito exposure and early detection.

Diagnosis remains one of the most critical gaps. Routine microscopy, still widely used in many settings, can misidentify *P. knowlesi* as other malaria species. Published analyses have reported very high misclassification of *P. knowlesi* as *P. malariae*, including rates above 80 percent in Sabah and Sarawak. This suggests the true burden may be underestimated. While PCR provides more accurate confirmation, it is not always immediately accessible in rural settings where time is critical.

Malaysia has responded with updated clinical guidance. The Ministry of Health issued a dedicated guideline on *knowlesi* malaria in 2025, emphasising early detection, prompt treatment, and heightened clinical suspicion in endemic areas. Artemisinin-based combination therapy remains effective, and intravenous artesunate is recommended for severe cases. These improve care but do not address ecological drivers of transmission.

The legal framework remains robust. Under the Prevention and Control of Infectious Diseases Act 1988, Act 342, malaria is a notifiable



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disease. Every confirmed case must be reported, investigated, and monitored. Yet zoonotic malaria reveals a limitation. Reporting human cases does not interrupt a transmission cycle that is sustained in wildlife and shaped by environmental conditions.

This is where the One Health approach moves from concept to necessity. Malaria in Borneo exists at the intersection of human health, animal reservoirs, and environmental change. Addressing it requires coordination across sectors, including forestry, wildlife management, agriculture, and labour. Prevention is no longer confined to the home. It extends to worksites, forest activities, and patterns of land use.

There is also a broader regional dimension. Borneo is a shared ecosystem, and malaria does not recognise national borders. Cases have been reported in Brunei despite its malaria free status, while parts of Kalimantan continue to face risks linked to migrant workers, mining activity, and expanding development zones such as Nusantara. These movements create conditions where transmission can persist and re-emerge, even in areas that have achieved elimination.

The policy challenge is therefore not a lack of awareness. It is a mismatch between the design of existing systems and the nature of the current threat. Many malaria control strategies were built around human-to-human transmission. Zoonotic malaria does not follow that model. It operates within a broader ecological system that requires different forms of surveillance, intervention, and coordination.

Despite progress, global malaria financing remains insufficient, with approximately USD 3.9 billion available in 2024, less than half of what is required. This gap reflects a broader reality. Malaria control, especially in its more complex forms, demands sustained investment and adaptation.

For communities in Sabah and Sarawak, these issues are not theoretical. They are lived experiences. A day spent working near the forest, a fever that develops overnight, and a delay in reaching care. These moments carry real consequences. Health workers in rural areas continue to operate under conditions where rapid diagnosis and treatment are essential, yet not always guaranteed.

World Malaria Day provides an opportunity to reflect, but it also demands honesty. Malaysia's success against human malaria is real and should be recognised. At the same time, the persistence of zoonotic malaria reminds us that elimination is not a final endpoint. It is a transition into a more complex phase of disease control.

Malaria in Borneo is no longer simply a story about infection. It is a story about ecology, development, and the limits of systems designed for a different era. It challenges us to rethink what elimination truly means and whether current approaches are sufficient for the realities on the ground. At the forest edge, malaria has not disappeared. It has adapted, and it continues to test whether public health systems can keep pace with a changing world.

Footnote
Melvin Ebin Bondi is a PhD candidate in Public Health at Universiti Malaysia Sabah. He writes a weekly public health column for The Borneo Post.



A blood-fed mosquito, a potential vector of malaria.



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SUMMARIES

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