

Brief Review on the Present State of Malaria in Africa and in Nigeria

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Abstract

Malaria is a major health issue in Nigeria, particularly affecting children under 12 years old. The disease is mainly caused by the parasite *Plasmodium falciparum*, which has a lot of genetic diversity, especially in the genes that code for surface proteins like MSP1 and MSP2. These proteins are important for the parasite's ability to invade red blood cells and are key targets for the immune system. Recent research has shown the high genetic diversity of *P. falciparum* in different parts of Nigeria. For example, a study in Ibadan found significant variations in the MSP1 and MSP2 genes, suggesting that multiple parasite clones exist within individual hosts. Similarly, a study in Minna, North-Central Nigeria, highlighted the extensive diversity and multiplicity of infections in *P. falciparum* isolates, illustrating the complex nature of parasite populations in that area.

Keywords: Nature, Distribution, Africa and Nigeria

1.Introduction to Malaria

Malaria is a life-threatening disease caused by parasites transmitted to people through the bites of infected female *Anopheles* mosquitoes. According to the World Health Organization (WHO), there were an estimated 229 million cases of malaria worldwide in 2019, leading to approximately 409,000 deaths, predominantly in sub-Saharan Africa (World Health Organization, 2020). The disease primarily affects children under the age of five and pregnant women, making it a significant public health challenge in endemic regions.

The causative agents of malaria are *Plasmodium* parasites, with *Plasmodium falciparum* and *Plasmodium vivax* being the most prevalent species affecting humans (Centers for Disease Control and Prevention [CDC], 2020). *Plasmodium falciparum* is responsible for the majority of severe cases and deaths due to its rapid multiplication and severe pathogenicity (CDC, 2020). Malaria transmission is influenced by various factors, including climate, vector ecology, and human behavior, which determine the disease's prevalence and seasonality in different regions.

Efforts to control and eliminate malaria have seen significant advancements in recent years. Strategies include the use of insecticide-treated bed nets (ITNs), indoor residual spraying (IRS), and artemisinin-based combination therapies (ACTs) (World Health Organization, 2020). Despite these efforts, challenges such as insecticide resistance, drug resistance, and gaps in healthcare infrastructure hinder the effective control of malaria in many endemic areas.

2.Present State of Malaria in Africa

Malaria remains a major public health issue in Africa, where the burden of the disease is disproportionately high compared to other regions of the world. According to the World Health Organization (WHO), Africa accounted for approximately 94% of all malaria cases and deaths in 2019 (World Health Organization, 2020). The high transmission rates in sub-Saharan Africa are driven by the prevalence of the highly efficient malaria vector, *Anopheles gambiae*, and the widespread presence of *Plasmodium falciparum*, the most deadly malaria parasite species (Centers for Disease Control and Prevention [CDC], 2020).

Efforts to combat malaria in Africa have seen some success. Between 2000 and 2015, the region experienced a significant reduction in malaria incidence and mortality rates, largely due to the increased distribution and use of insecticide-treated bed nets (ITNs), indoor residual spraying (IRS), and the deployment of artemisinin-based combination therapies (ACTs). However, progress has slowed in recent years, with challenges such as insecticide and drug resistance threatening to undermine.

Insecticide resistance among mosquito populations is a growing concern in many African countries. Resistance to pyrethroids, the most commonly used insecticides for ITNs and IRS, has been reported across the continent, reducing the effectiveness of these key interventions. Similarly, the emergence of resistance to artemisinin and partner drugs among *Plasmodium falciparum* strains poses a serious threat to malaria control and elimination efforts

African nations and international partners are focusing on developing and implementing new tools and strategies to address these challenges. These include next-generation bed nets treated with multiple insecticides, novel antimalarial drugs, and integrated vector management approaches that combine biological, environmental, and chemical methods to reduce mosquito populations (World Health Organization, 2020). Continued investment in research, health infrastructure, and community engagement is essential to sustain and accelerate the fight against malaria in Africa.

3. Present State of Malaria in Nigeria

Nigeria bears the highest burden of malaria globally, accounting for about 25% of all malaria cases and nearly 24% of deaths worldwide (World Health Organization [WHO], 2020). The disease is endemic throughout Nigeria, with transmission occurring all year round, peaking during and just after the rainy season (National Malaria Elimination Programme [NMEP], 2020). *Plasmodium falciparum* is the predominant parasite species, responsible for almost all cases of malaria in the country (Centers for Disease Control and Prevention [CDC], 2020).

Efforts to control malaria in Nigeria have involved a multi-faceted approach, including the distribution of insecticide-treated bed nets (ITNs), indoor residual spraying (IRS), and the use of artemisinin-based combination therapies (ACTs) (Federal Ministry of Health [FMOH], 2020). Despite these efforts, the prevalence of malaria remains high. The 2018 Nigeria Demographic and Health Survey (NDHS) reported that 23% of children under five tested positives for malaria using rapid diagnostic tests (RDTs) (National Population Commission).

One of the critical challenges in the fight against malaria in Nigeria is the widespread resistance to insecticides used in ITNs and IRS. Resistance to pyrethroids, the main class of insecticides used for ITNs, has been documented in several states, reducing the effectiveness of this intervention. Additionally, issues such as inadequate healthcare

infrastructure, lack of access to healthcare services in remote areas, and insufficient funding for malaria programs hinder the overall effectiveness of malaria control efforts

To address these challenges, Nigeria's National Malaria Elimination Programme (NMEP) is focusing on several strategic priorities. These include scaling up the distribution of ITNs, expanding access to diagnostic testing and effective treatment, strengthening health systems, and enhancing surveillance to monitor the impact of interventions. Moreover, there is a growing emphasis on community engagement and behavior change communication to improve the uptake of malaria prevention and treatment measures.

4. Present State of Malaria in Ondo State

Ondo State, located in southwestern Nigeria, is one of the regions heavily affected by malaria. The disease remains a significant public health issue, contributing to high morbidity and mortality rates, particularly among children under five and pregnant women (National Malaria Elimination Programme [NMEP], 2020). Malaria transmission in Ondo State is perennial, with peaks corresponding to the rainy season, similar to other parts of Nigeria.

Efforts to control malaria in Ondo State have included the distribution of insecticide-treated bed nets (ITNs), indoor residual spraying (IRS), and the provision of artemisinin-based combination therapies (ACTs) (Ondo State Ministry of Health, 2020). The state government, in collaboration with national and international partners, has undertaken several initiatives to reduce the malaria burden. For instance, mass distribution campaigns for ITNs have been conducted to ensure widespread coverage and usage.

Despite these efforts, challenges persist in the fight against malaria in Ondo State. Insecticide resistance among *Anopheles* mosquitoes, the primary vectors of malaria, poses a significant challenge, reducing the effectiveness of ITNs and IRS. Moreover, gaps in healthcare infrastructure, limited access to healthcare services in rural areas, and inconsistent supply of antimalarial drugs hinder effective malaria control.

To address these challenges, Ondo State is focusing on several strategic interventions. These include enhancing malaria surveillance systems to provide timely data for decision-making, strengthening health systems to ensure the continuous supply of malaria commodities, and promoting community engagement to improve the uptake of malaria prevention and treatment measures. Additionally, integrated vector management strategies are being explored to complement existing interventions and tackle insecticide resistance. Malaria has long been recognized as a major public health burden, particularly in sub-Saharan Africa, where children under 12 years are disproportionately affected (WHO, 2022). The disease is primarily caused by *Plasmodium falciparum*, a parasite noted for its high genetic diversity and adaptability, which complicates both treatment and control strategies. Over the decades, molecular epidemiology has emerged as a pivotal field in understanding

malaria transmission dynamics, parasite diversity, and the impact of interventions. Among the various genetic markers used to study *P. falciparum*, the Merozoite Surface Proteins-MSP1 and MSP2-have gained prominence due to their high polymorphism and critical role in the parasite's life cycle and immune evasion

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