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Letter to the Editor

R21/Matrix-M™ malaria vaccine: A realm of hope for combating malaria in developing countries?

Dear Editor,

Malaria, caused by Plasmodium parasites, primarily transmitted by infected Anopheles mosquitoes in tropical regions, remains a global health threat. Despite being preventable and curable, an estimated 241 million cases and 627,000 deaths occurred in 2020. Malaria symptoms, typically appearing within 10–14 days of infection, can include fever, chills, sweating, headache, and muscle aches. Children under five years old are disproportionately affected by malaria, bearing over 60 % of the global death toll despite of vaccination.This burden is concentrated primarily in sub-Saharan Africa, which, despite accounting for most cases (241 million) and deaths [000,627] globally in 2020, is not the only region facing challenges. Even countries like Pakistan, with 3.4 million cases and 1200 deaths reported in 2020, demonstrate the widespread impact of this disease [1]. Despite significant progress with preventive measures like insecticide-treated nets and medication, malaria remains a major public health concern, particularly in developing countries. These existing methods face limitations like resistance development, cost, and uneven coverage, hindering their long-term effectiveness [2].This letter to the editor highlights the recent approvals of the RTS,S/AS01 and R21/Matrix-M vaccines offering crucial additions to existing preventive measures like insecticide-treated nets. While these vaccines have limitations, they are recognized by WHO as game-changers with the potential to significantly impact malaria control, particularly for high-risk groups in underdeveloped areas lowering the burden of their already crippling healthcare system.

The P. falciparum circumsporozoite protein (PfCSP) is the most abundant antigen on the sporozoite surface and an important target for malaria vaccines. R21 is a virus-like protein based on the PfCSP fused to the N-terminus of the HBsAg, combined with the Matrix-M proprietary adjuvant that enhances the immune system response [3]. This vaccine was developed by the University of Oxford, UK, and includes the Novavax proprietary saponin-based adjuvant, Matrix-M (licensed to Serum Institute of India Pvt. Ltd.). R21/Matrix-M™ has been awarded prequalification status by the WHO and approved in Ghana and Nigeria. In the latest double-blind, randomized, controlled, phase 2b trial, the R21 Vaccine, with two different doses of adjuvant Matrix-M, was given to children aged 5–17 months in Nanoro, Burkina Faso—a highly seasonal malaria transmission setting. The R21 vaccine has shown to reduce symptomatic cases of malaria and good efficacy (66 %) by 75 % during the 12 months following a 3-dose series, compared to the previous RTS, S/AS01 vaccine approved by WHO, which had a vaccine efficacy of 68 % over a period of 6 months following administration of the initial three doses, which diminished over time. A fourth dose given a year after the third maintained the same efficacy in case of R-21, whereas vaccine efficacy was 44 % at 6 months after a fourth dose in case of RTS,S/AS01. In children who received R21 with the higher dose of Matrix-M adjuvant, efficacy was 80 % at 12 months following the booster vaccination [4]. At prices of US$ 2 – US$ 4 per dose, the cost-effectiveness of the R21 vaccine would be comparable with other recommended malaria interventions and childhood vaccines. The R-21 vaccine was shown to be safe in clinical trials [5] As with other new vaccines, safety monitoring will continue. The demand for the first malaria vaccine, RTS,S/AS01, has consistently exceeded its available supply. The introduction of R21/Matrix-M, is expected to address this supply-demand gap. Both vaccines, R21 and RTS,S, have not been directly compared in a head-to-head trial yet. The decision on which vaccine to use in a particular country should be guided by programmatic factors, vaccine availability, and cost-effectiveness considerations.

The World Health Organization (WHO) remains committed to eradicating malaria globally, aiming for a 90 % reduction in cases and deaths by 2030 compared to 2015 levels. Their strategy focuses on prevention, diagnosis & treatment, and innovation, including malaria vaccines.The recent approval of the R21/Matrix-M vaccine marks a significant step forward in the fight against malaria, offering a potentially powerful tool to protect vulnerable populations, particularly children. However, sustained efforts are crucial to ensure its widespread accessibility and integrate it into comprehensive malaria control strategies in developing countries. At least 28 countries in Africa plan to introduce a WHO-recommended malaria vaccine as part of their national immunization programmes due to their high efficacy, high impact,cost effectiveness and safety profile [1].Continued investment in research and development of even more effective vaccines, alongside unwavering support for existing preventive measures and vaccination programs, is essential to safeguard children's health and achieve a malaria-free future. Policymakers, funders, and stakeholders must prioritize these endeavors to ensure equitable access to life-saving interventions and ultimately secure a healthier future for all.

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Declaration of competing interest

The authors declare that there no conflict of interest.

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References

[1] World Health Organization. World malaria report 2022. https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2022; 2023.
[2] Liu W, Wu Y, Huang Y, He W. The next generation of malaria vaccines: challenges and opportunities. Lancet Infect Dis 2023;23(2):e61–70.
[3] Parums DV. Editorial: current status of two adjuvanted malaria vaccines and the World health organization (WHO) strategy to eradicate malaria by 2030. Med Sci Monit 2023;29:e939357. https://doi.org/10.12659/MSM.939357. Published 2023 Jan 1.
[4] Datoo MS, Natama HM, Somé A, Bellamy D, Traoré O, Rouamba T, Tahita MC, Ido NFA, Yameogo P, Valia D, Millogo A, Ouedraogo F, Soma R, Sawadogo S, Sorgho F, Derra K, Rouamba E, Ramos-Lopez F, Cairns M, Provstgaard-Morys S, Aboagye J, Lawrie A, Roberts R, Valéa I, Sorgho H, Williams N, Glenn G, Fries L, Reimer J, Ewer KJ, Shaligram U, Hill AVS, Tinto H. Efficacy and immunogenicity of R21/Matrix-M vaccine against clinical malaria after 2 years' follow-up in children in Burkina Faso: a phase 1/2b randomised controlled trial. Lancet Infect Dis 2022;22(12):1728–36. https://doi.org/10.1016/S1473-3099(22)00442-X. Epub 2022 Sep 7. PMID: 36087586.
[5] Datoo MS, Dicko A, Tinto H, Ouédraogo JB, Hamaluba M, Olotu A, Beaumont E, Ramos Lopez F, Natama HM, Weston S, Chemba M, Compaore YD, Issiaka D, Salou D, Some AM, Omenda S, Lawrie A, Bejon P, Rao H, Chandramohan D, Roberts R, Bharati S, Stockdale L, Gairola S, Greenwood BM, Ewer KJ, Bradley J, Kulkarni PS, Shaligram U, Hill AVS, R21/Matrix-M Phase 3 Trial Group. Safety and efficacy of malaria vaccine candidate R21/Matrix-M in African children: a multicentre, double-blind, randomised, phase 3 trial. Lancet 2024;403(10426):533–44. https://doi.org/10.1016/S0140-6736(23)02511-4. Epub 2024 Feb 1. PMID: 38310910.

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