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Letter to the Editor

Malaria vaccine in India: need and choice

Sir,

Malaria is a major public health problem in India. India's varied geography and diverse climatic conditions from tropical monsoon in the south to temperate in the north, favor the distribution of vectors and species of the malaria parasite. Malaria in India takes several forms, including forest/ tribal malaria, urban malaria, industrial malaria, and plains malaria. *P. falciparum* and *P vivax* species contribute to the majority of malarial cases and deaths in India.

According to the world malaria report 2021 released by the world health organization (WHO) about 241 million malarial cases and 0.63 million malarial deaths were estimated worldwide in 2020. WHO African region shoulders the heaviest burden of malaria globally, followed by the South East regions (SEAR) with nine malarial endemic countries. About 83% of estimated malarial cases and 82% of malarial deaths in WHO SEAR is contributed by India.[1] Most malarial deaths occur in children under five years of age.

Despite having the highest malarial burden in the SEA region, India has witnessed a gradual reduction in the malarial burden over the past two decades. Figure 1 depicts the change in the trend of malaria over the past two decades. The mortality due to malaria has drastically lowered in the recent past, yet the incidence of malaria in India remains relatively higher.[1]

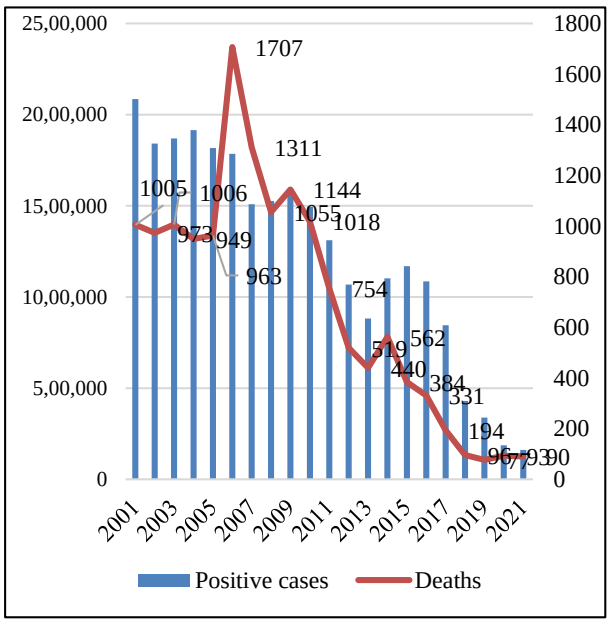

Figure 1: Trend of malaria cases and deaths in India 2001-21.

In accordance with the global technical strategy for malaria 2016-2030, India has committed to a vision of a malaria-free country by 2027 and malaria elimination by 2030. To achieve the ambitious targets set forth by the national framework for malaria elimination to reduce malaria mortality, a novel, highly-effective significantly, anti-malarial vaccine is needed.[3]

Vaccines have been a promising tool towards the elimination and eradication of various infectious diseases from the world. Malarial vaccines hold significant promise to save lives of children with severe malaria infections. The history of the malaria vaccine dates back 1967, however newer technology was used isolate and deliver specific antigens in a vaccine instead of attempting a live attenuated vaccine since 2002.[3] Over the past three decades, multiple strategies were implemented in the malarial vaccine development. Numerous novel tools such as self- amplifying RNA, self-assembling protein nano particle nano particles (SAPN), novel virus like particles that display circumsporozoite protein (CSP) epitomes and delivery of whole organism vaccine to generate a broad immune response were deployed in vaccine development.[4]

WHO recommended the use of the malarial vaccine to be used to prevent *P. falciparum* malaria in regions with modern to high transmission, yet the potential pre-erythrocytic vaccine is still in phase I or II trials. The RTS, S/AS01 vaccine stands first in malaria vaccine development as it has advanced to Phase 3 trial and has received a favourable opinion from the CHMP of the European medicines agency and is considered by the WHO advisory committees for implementation studies in areas with moderate-to-high malaria transmission. It acts by inducing high levels of antibodies to block the sporozoites entering the liver cells and tag specific infected cells for destruction. It was developed in 1987 and came into effect as a pilot program in endemic African countries (Ghana, Kenya, and Malawi) in 2019.[5] The ongoing RTS, S/AS01 vaccine pilot program has reached out to more than 8,30,000 children through a routine immunization platform with an ambitious goal of averting serious malaria complications as well as adverse neurodevelopmental consequences in young children.

The transmission blocking vaccine candidate vaccine Pfs25-EPA developed by the US national institute of allergy and infectious diseases laboratory of malaria immunology and virology and Johns Hopkins university acts by producing antibodies against the Pfs25 antigen in human circulation. Thus, a mosquito taking these antibodies with its blood meal encounters the antigen and destroys the parasite. The limitation of the Pfs25-EPA

Vaccine is that it is administered via intravenous route, thereby necessitating enhanced capacity building for vaccine administration.[6] The other R21 vaccine also targets pre-erythrocytic sporozoites and produces an enhanced immune response to the circum-sporozoite protein (the major surface protein of Plasmodium sporozoites). The efficacy of the malarial vaccines is still proven to be less than 50%, yet considering the higher incidence of malaria among children in India, it is recommended to use the vaccine in high endemic pockets.[5] Great progress has been made in malaria vaccine development, yet multidimensional efforts to be taken to improve its efficacy. Thus, the vaccine in combination with integrated vector control measures has the capacity to make a solid contribution to malaria control in areas of high transmission in India.[7]

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