

Malaria Vaccine: An Update

Rajiv Kumar Gupta, Rashmi Kumari

Malaria is among the oldest of human diseases which appeared in documents as early as 2700 B.C.(1) Malaria is not only a disease of poverty but also a disease that impoverishes. The disease affects extremely vulnerable populations and in particularly young children living in poor countries with fragile health systems. As per World Malaria Report 2018, the disease kills 4,35,000 people every year, mostly in Africa where a child dies every 2 minutes from the disease. Children below 5 years of age, pregnant women and people with HIV/AIDS are most at risk for severe illness and death.(2)

In this context, malaria vaccines are considered among the most important modalities for potential prevention of malaria disease and reduction of malaria transmission. Since last few decades, an intense effort is being carried out by many groups in this field. For a potential malaria vaccine candidate, three stages to target are--

- i. Pre-erythrocytic stage
- ii. blood stage of the parasite, and
- iii. gametocyte stage.

A concerted international effort is coming to fruition with accelerated clinical development of malaria vaccine targeting various stages of malaria parasite life cycle (3). Among the many potential malaria vaccine candidates in

different stages of evaluation, only RTS,S vaccine after completion of Phase 3 evaluation has received a positive regulatory assessment. Phase 3 trial of RTS,S conducted from 2009-2014 enrolled about 15,000 young children and infants in 7 sub-Saharan countries. Among children aged 5-17 months who received 4 doses of RTS,S the vaccine prevented 39% cases of malaria over 4 years of follow up and 29% cases of severe malaria with significant reductions also seen in overall hospital admissions as well as admissions due to malaria or severe anaemia.

European Medical Agency (EMA) in 2015 reported that quality of vaccine and its risk benefit profile are favourable from a regulatory perspective. The WHO advisory group then recommended pilot implementation of RTS,S in 3-5 settings in Sub-Saharan Africa.(4) The selected countries included Malawi, Ghana and Kenya based on desire by Ministry of Health of these nations to engage in the MVIP(Malaria Vaccine Intervention Programme) along with well functioning malaria and immunization programmes besides other inclusion criterion. Some areas selected will serve as comparator areas in which the vaccine will not be available initially. Vaccination began in Malawi on 23rd April 2019 followed in next few weeks in rest of the two countries. MVIP is expected to continue through 2022 and likely to provide

From the: Department of Community Medicine, Govt. Medical College Jammu, J&K India

Correspondence to : Dr. Rajiv Kumar Gupta, Professor, Community Medicine, Govt. Medical College Jammu, J&K India

data on the programmatic feasibility of delivering the vaccine in real life settings, the safety profile of RTS,S in the context of routine use and vaccine impact on child survival. These results together hold key to future decisions on the wide scale deployment of vaccine. Scientists are working on improving the efficacy of RTS,S vaccine to get it to be >50% effective by employing prime boost technology, adjuvants and antigen optimization.(5) Licensing of first proven malaria vaccine RTS,S adds to our defensive arsenal and makes a significant battle against the disease. This is just the start of what may be a new era of wins in the fight against malaria. Other malaria vaccines are also in the pipeline-including one which uses whole sporozoite- PfSPZ (irradiated for safety) and has been found safe and well tolerated in infants and young children. It is likely to undergo clinical trials shortly.

Malaria vaccine is proposed as a potential additional tool to complement the existing package of WHO- recommended preventive, diagnostic and curative measures for malaria. A long term goal in malaria vaccine development may be multi-antigen, multi-stage vaccine that inhibits Pre-erythrocytic stages, asexual parasite growth and mosquito stage development.(6)

Finally, the roadmap for malaria vaccine by 2030:

- i) Develop and license malaria vaccine with protective efficacy of at least 75% against clinical malaria for areas with ongoing malaria transmission.
- ii) Develop malaria vaccine that reduces transmission and human malaria infection, enabling elimination in multiple settings through mass vaccination campaigns.

References

1. CDC. The history of malaria, an ancient disease. Accessed 01/05/2019.
2. WHO. Malaria fact sheet. Accessed 01/05/2019.
3. Geneva, Switzerland: World Health Organization; 2010. World Malaria Report 2010.
4. WHO. Pilot implementation of first malaria vaccine recommended by WHO advisory board. Accessed 01/05/2019.
5. <http://www.malariavaccine.org/rd-collaborations.phps> Accessed 01/05/2019.
6. Hermsen CC, de Vlas SJ, van Gemert GJ, *et al.* Testing vaccines in human experimental malaria: Statistical analysis of parasitemia measured by a quantitative real-time polymerase chain reaction. *Am J Trop Med Hyg* 2004;71:196-201.