



Perspective

Connecting the dots to strengthen malaria elimination strategies in India: A Malaria Elimination Research Alliance - India initiative

Despite a substantial decline in the burden of malaria, the world continues to battle this scourge with 228 million cases and 24,000 deaths occurring each year as reported in 2018¹. India shares 85 per cent of the malaria cases of South-East Asia and almost half of global *Plasmodium vivax* cases. India has reported 338,494 cases and 77 deaths in 2019 across 36 States and Union Territories as per data from the National Vector Borne Disease Control Programme of the Ministry of Health and Family Welfare (MoHFW), India, in 2019². Responding to the World Health Organization (WHO)'s goal, India launched National Framework of Malaria Elimination in 2016 with the overall aim of zero indigenous malaria cases in the country by 2030³. India has performed well so far in reducing the burden of malaria and was the only other country besides Uganda which recorded a decline in the number of cases¹. Elimination of malaria in India requires conscientious efforts not only from nodal government national programme but also from all partners in the field of malaria, including research bodies, educational institutes, private sector and community. As India marches towards elimination with an impressive decline, it is critical to identify the roadblocks and also to find tangible solutions.

Understanding that malaria elimination will require concerted research efforts focussed on operational and implementation research, the Indian Council of Medical Research (ICMR) launched Malaria Elimination Research Alliance (MERA)-India in 2019 on the eve of World Malaria Day (April 24, 2019), in the presence of various stakeholders⁴. The stakeholders consultation coupled with the launch of MERA-India was held on April 24, 2019. The stakeholders the MoHFW, WHO-South-East Asia Regional Office (WHO-SEARO), Directorate of National Vector Borne Disease Control Programme, Armed Forces *viz.* Army, Navy, Air force, Para-Military Forces like BSF, CRPF,

ITBF *etc.*, Department of Biotechnology, Department of Science and Technology, international partners, Gates Foundation, Public Health Foundation of India, State governments, ICMR institutes and others.

The national programme articulated the challenges impeding the success of malaria elimination efforts. Concerted and focussed discussions took place on the identified barriers and the ways to address them. Since MERA-India is focussed on studies in a mission mode, which will directly feed into elimination efforts of the country, the national programme broadly identified the areas which required research evidence to support the proposed interventions. These broad areas were threadbare discussed in the expert group meetings subsequently held to set the priorities for research in different domains of malaria. The ICMR initiative was appreciated by the WHO-SEARO and the MoHFW, Government of India, during the World Malaria Day commemoration on April 25, 2019. The WHO-SEARO pledged all support and partnership in this endeavour. The MERA-India, under the leadership of Director General, ICMR, steered by the ICMR-National Institute of Malaria Research (ICMR-NIMR), New Delhi, aims to strengthen the research ecosystem of the country for malaria elimination from India by 2030⁵. In particular, MERA-India is a platform for malariologists, researchers and organizations working in the different realms of malaria. The aim is to bring them together and share knowledge, resources, ideas and funding opportunities⁶. MERA-India's newsletter shares the updated information and latest literature via its website. The presence on social media such as Twitter, Facebook, LinkedIn and YouTube connects MERA-India with the global scientific community and general public.

Nonetheless, MERA-India has moved forward in 2020 and has made great strides. We report here the

progress of this initiative in the first year and reveal its organizational and scientific vision.

Soon after its launch in April 2019, the think tank of MERA-India decided to conduct priority setting meetings of different thematic working groups (TWGs) covering various domains of malaria, namely epidemiology, parasite biology and vector control. The TWGs comprise eminent experts in different domains of malaria in addition to the programme managers. Consequently, in July and September 2019, the priority setting exercise was completed and the TWGs provided the recommendations based on gap analysis of multiple facets of malaria. Their major recommendations are summarized here: (i) facilitate studies on the dynamics of *P. vivax* malaria in the domains of clinical biology, pathophysiology, epidemiology, transmission, Glucose-6-phosphate dehydrogenase (G6PD) testing, anti-relapse therapy and primaquine compliance issues, (ii) launch studies on low-density malaria infections and their impact on transmission, (iii) initiate studies on monitoring of drug resistance - especially artemisinin tolerance, (iv) facilitate studies on the movement of human populations in vulnerable areas and the overall impact of such migrations on malaria, (v) address issues with community behaviour, accessibility, utilization of health services and vector control measures, (vi) research vector bionomics in context of changing behaviour of vectors, (vii) study insecticide resistance and especially in residual malaria districts, and (viii) start studies on residual, forest, urban and industrial malaria. Research proposals were invited based on the above recommendations from researchers across different disciplines and domains. An overwhelming response was received with more than 175 proposals from across the country (Fig. 1) and abroad (1 from Beijing and 1 from San Diego). These were subsequently screened and reviewed thoroughly.

There proposals were categorized in the following thematic areas: (i) low-density infections and transmission potential, (ii) vector biology and control, (iii) community behaviour, (iv) geographical information system, (v) migration, and (vi) use of artificial intelligence in malaria. An investigator-centric brainstorming meeting was held in the early 2020 with an aim to discuss broad themes of MERA-India, to create networks among malariologists and encourage cross-talk amongst researchers and to provide a platform for discussions. This meeting came up with draft concept notes on these thematic areas.

Among the thematic areas listed above, *i-iv* were taken forward in 2020. The themes of migration and artificial intelligence were dropped. As a result, shortlisted proposals in the four thematic areas, *viz.* low-density infections, vector biology, community behaviour and geographical information systems, were considered and developed further for deployment at seven different sites across India (selected using criteria of malaria epidemiology, types of parasite and vector prevalence) in consultation with the subject experts. More geographical sites of importance from malaria endemicity point of view would be included in the next round. The selected sites were Bareilly in Uttar Pradesh; Jodhpur and Bikaner in Rajasthan; Kokrajhar, Udalguri in Assam; South Tripura in Tripura; Chennai, Ramanathapuram, Kanyakumari and Dharmapuri in Tamil Nadu; North and South Goa in Goa; Raipur in Chhattisgarh and Nadiad and Surendra Nagar in Gujarat. The studies in various themes are intended to address various dimensions of malaria ranging from low parasitaemia to behavioural barriers of the community. The current diagnostic tools such as rapid diagnostic tests and microscopy have their own limitations in terms of level of detection of parasites. In the elimination phase, more sensitive tools would be required. Therefore, moving in this direction, one of the themes is detection of low-density infection among the population, and the studies have been developed at seven sites across the country keeping in consideration the endemicity, types of parasites and their preponderance, vector biology and other situational factors. After several meetings with the experts and investigators, it was decided to use real-time PCR method (with same brands of commercial kits) across all the sites. The investigators from different disciplines were from medical colleges/universities and ICMR and non-ICMR institutes (Fig. 2).

Senior experts from each of the four domains were appointed as coordinators of each theme. These in turn have extended tremendous support to MERA India. During the course of shortlisting the subjects and proposals received, standard common protocols were developed with the support of subject experts. These protocols served as templates for the investigators to develop their site-specific proposals ensuring quality, uniformity and robustness. Moreover, the development of protocols was a participatory process taking along the investigators and hence also acted as a capacity building process. Several operational issues/barriers

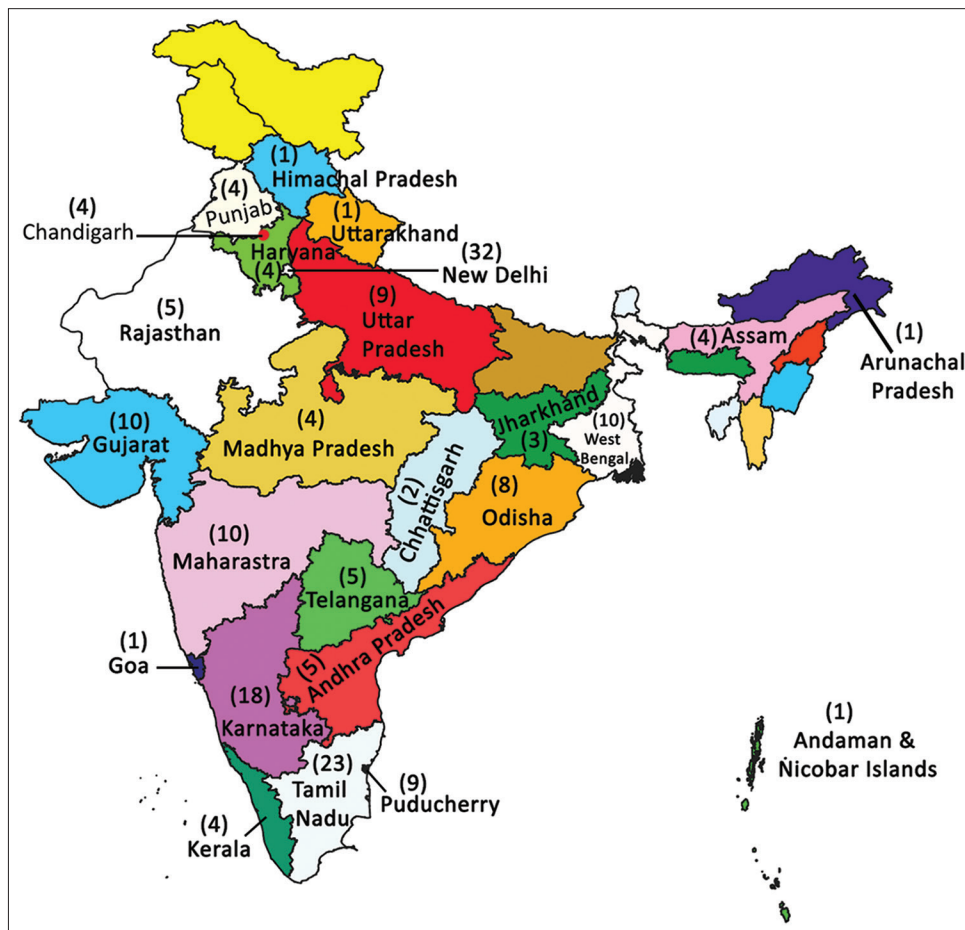


Fig. 1. Map showing the distribution of the proposals received in the first call under MERA-India.

were identified which were site-specific, and therefore, the solutions were also tailored according to the site needs.

Standard protocol also includes standard reporting formats and digital data reporting by all sites. This would ensure near real-time reporting, prompt analysis and data communication to local health authorities. A digital data integration platform has been proposed for India which will encourage different stakeholders including private sector and allied government sector to report malaria related data on a single digital dashboard⁷.

The principal investigators, mentored and guided by coordinators, developed well-defined and robust proposals. These were reviewed by an independent peer-review committee and sent for funding. Besides, the 24 studies being funded in the above four themes, six independent studies on specific subjects have also been supported under MERA-India. It is expected that these research studies will fill the gaps in our

understanding of malaria and provide solutions wherever possible. The studies, once rolled out, would be closely monitored by MERA-India during the entire duration of funding. We are cognizant of the fact that COVID-19 presents its own challenges in the deployment of field-based research studies and thus provisions for precautionary measures would be ensured. At the same time, it is to be appreciated that mitigation programmes against COVID-19 in various countries have provided valuable lessons for malaria control, be it strong leadership, prompt response, real-time reporting of cases, easy access to epidemiological data, digital dashboards, sharing of resources and the involvement of multiple stakeholders in coherence⁸. Similarly, malaria control programmes can provide a platform to launch COVID-19 control programmes, as and when commenced in the afflicted countries⁹.

During its first year, MERA-India has identified several areas where more attention is required. The

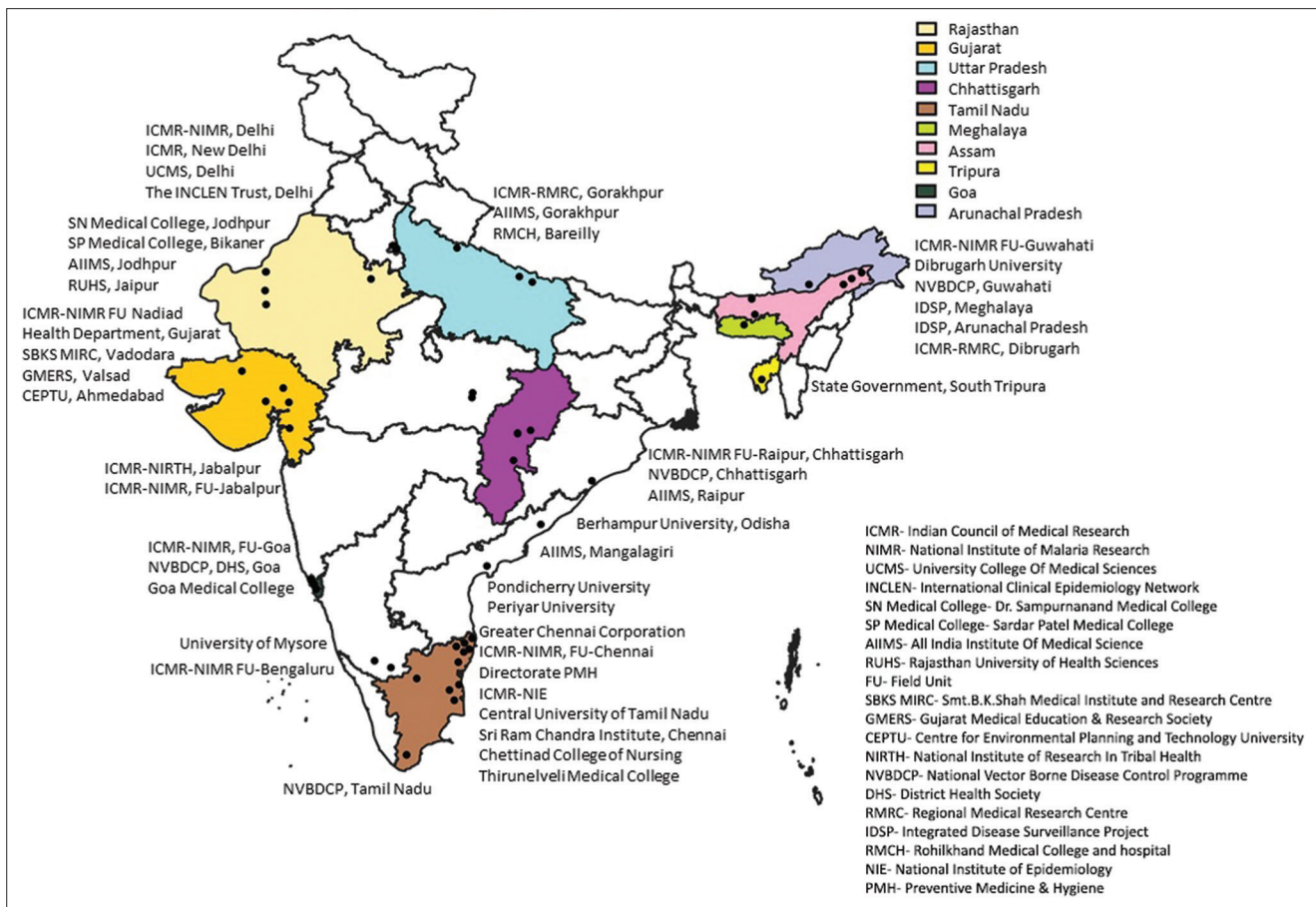


Fig. 2. Map showing the participating institutes and the geographical sites of approved studies being rolled out in the first year.

crucial gap areas were identified with the subject experts in the field of parasitology, vector biology and control and epidemiology. The alliance will try to cover all the areas in the next and future calls for proposals. For example, focussing on advanced tools such as artificial intelligence and data science and inclusion of more significant sites in addition to those mentioned in seven sites is planned.

As we moved into the second year of MERA-India, it became important to formulate a transparent pathway of deliverables from first year and themes for second year. We decided to focus on the gaps in the malaria elimination efforts with identification of the drivers of continuous transmission in certain areas of high malaria incidence. The MERA-India would be focussing on artificial intelligence and surveillance, data science, border malaria studies and pan-India vector mapping themes in the subsequent calls of proposals. There is a need to delineate the bottlenecks in malaria

control in highly afflicted districts and then provide economical scientific solutions. Once again, investigators would be invited to brainstorm in-depth with subject experts from multiple domains. One of the major mandates of the programme will be addressed which involves virtual outreach meetings conducted by MERA-India staff members at ground level to spread awareness among people about the objectives. The Alliance also plans for robust public engagement and outreach programmes for the lay audience and schoolchildren. The establishment of similar alliance to tackle infectious and non-communicable diseases in India is also proposed, and the ICMR will again take the lead in this.

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**Manju Rahi¹, Sachin Sharma², Payal Das¹,
Anup Anvikar², Monica Pandey² & Amit Sharma²***

¹Division of Epidemiology and Communicable Diseases, Indian Council of Medical Research, New Delhi 110 029, ²MERA-India Office, National Institute of Malaria Research, Dwarka, New Delhi 110 077, India

*For correspondence:
directornimr@gmail.com

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