NIMR
NATIONAL INSTITUTE OF MALARIA RESEARCH

ICMR
INDIAN COUNCIL OF MEDICAL RESEARCH
Serving the nation since 1911

MERA India
Malaria Elimination Research Alliance India
One Platform, One Goal

MERA-India brings you...

NEWS & VIEWS

Issue 34 | August 2023

Interviews

Dr K. Raghavendra
Scientist-G (Retired),
ICMR-NIMR,
New Delhi

Dr Yadlapalli S. Kusuma
Professor,
Centre for Community Medicine,
AIIMS, New Delhi

Upcoming

Lecture Series on Infectious Diseases 2.0

Professor Michael C. Wimberly
Professor, Department of Geography and Environmental Sustainability,
University of Oklahoma, USA

Editorial

Dear Readers,

MERA-India team brings you the thirty-fourth issue of our newsletter, "News & Views".

Scientists at GlaxoSmithKline (GSK) laboratories in Spain stumbled upon a remarkable finding while working on malaria drugs. They found that a strain of naturally occurring bacterium called *Delftia tsuruhatensis* (named TC1) inhibited the development of the malaria parasite in mosquitoes, preventing transmission to humans. The team collaborated with Johns Hopkins and Fundación MEDINA to identify the inhibitor component- a toxic alkaloid called harmane- which is secreted by the bacterium. This substance inhibited the development of female *Plasmodium* parasite gametes in the mosquito gut. Since the bacterium remains within the mosquito throughout its life, it could serve as a safe and effective means of preventing the transmission of malaria. This ground-breaking discovery could enable new strategies to combat malaria, such as blending sugar baits with bacteria instead of insecticide, incorporating harmane in bed nets, or spraying on walls.

Professor Thomas Churcher from Imperial College London, UK was one of the authors of this remarkable discovery and we had the opportunity to interact with him, through “Lecture Series on Infectious Diseases 2.0”. He was the seventh speaker of the series, and, focused his talk on optimizing malaria vector control in Africa. The highlights from the informational lecture have been enclosed in this newsletter.

In the 'Malaria Scientists to Watch' section we have covered impactful and enlightening interviews of Dr K Raghavendra, Scientist G (Retired), Indian Council of Medical Research-National Institute of Malaria Research (ICMR-NIMR), Delhi, and Dr Yadlapalli S Kusuma, Professor, Centre for Community Medicine, All India Institutes of Medical Sciences, New Delhi.

We have showcased three research articles focussed on malaria in the "Research in Spotlight" section. Lai *et al.* assessed a simple DNA extraction method combined with LAMP for detecting *Plasmodium knowlesi*. Urassa *et al.* suggested using conventional PCR for gametocyte detection instead of light microscopy for superior sensitivity. In the third article, Khan *et al.* discussed the challenges of eliminating malaria in India due to the widespread distribution of malaria parasites and vectors.

Further, the "Malaria Through the Lens of Researchers" section showcases an image submitted for the MERA-India Image Competition 2022 by Ms Poonam Saroha, ICMR-NIMR, New Delhi.

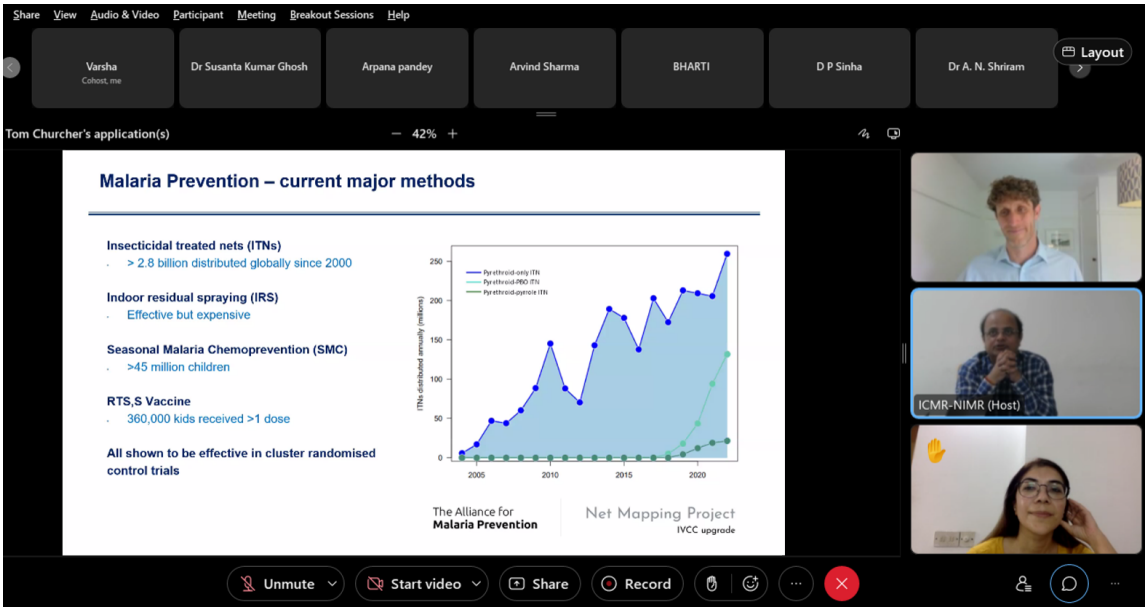
Check out the "Upcoming Events" section for information on the upcoming ninth lecture in the Lecture Series on Infectious Diseases 2.0. Professor Michael Wimberly from the University of Oklahoma, USA will be delivering the lecture.

We hope that you will find this issue engaging and fascinating. Please write to us for any feedback or suggestions regarding the newsletter's content at meranewsletter@gmail.com.

With best wishes,
MERA-India team

ICMR-NIMR & MERA-India Activity

Lecture Series on Infectious Diseases 2.0: Lecture 07 by Professor Thomas Churcher



The seventh lecture in the ICMR-NIMR and MERA-India Lecture Series on Infectious Diseases 2.0 was delivered by Professor Thomas Churcher on July 12, 2023. Currently affiliated with Imperial College London, Professor Thomas Churcher is an entomologist, parasitologist, and mathematical modeller with a focus on malaria research. He led the development of the vector control components of the most widely recognized transmission dynamics model for malaria. Professor Churcher actively collaborates with public health organizations and industry partners. He increasingly engages with international donors and national malaria control programs. His primary focus lies in comprehending various threats to malaria control, such as the emergence of insecticide resistance, the spread of invasive mosquito species, and the impact of climate change. Dr Manju Rahi, Scientist-F, ICMR, and Principal Investigator, MERA-India, welcomed Professor Churcher, and Dr Sachin Sharma, Chief Consultant, MERA-India, introduced him to the audience.

Professor Churcher gave a lecture on the topic entitled ‘Optimising malaria vector control in Africa’. He began the lecture with a brief introduction to the malaria situation globally and in Africa. The lecture was focused on two main aspects: geospatial statistical modelling for predicting the malaria situation and using experimental hut trials to understand the resistance status of mosquitoes to various vector control interventions. The geospatial models work based on combining the data and satellite-derived maps with cutting-edge machine learning methods to find statistical analysis between malaria and how it has changed over time. Taking the example of bed nets, Professor Churcher explained how the increased distribution of bed nets has led to a reduction in malaria cases over the last two

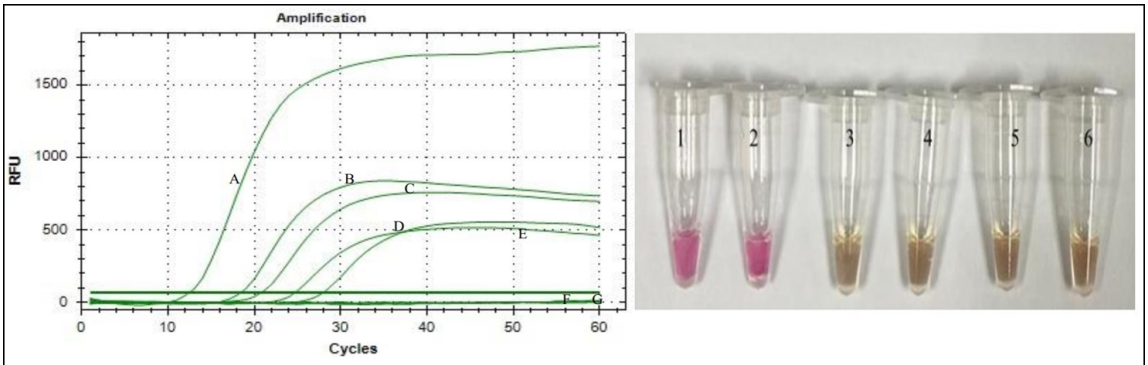
decades. The next aspect of the lecture was experimental hut trials, which can serve as a better method in comparison to randomized control trials for predicting the impact of interventions and resistance. Professor Churcher exemplified this method by demonstrating the results of experimental hut trials performed to study the status of insecticide-treated nets (ITNs) and resistance against them. Predicting the actual scenario will be helpful in improving the applicability of intervention strategies and making recommendations for transitioning to more effective strategies to derive maximum benefits from them. Professor Churcher concluded the lecture by highlighting the public health benefits of switching nets and forecasting the demands that will have a substantial impact on averting malaria cases and deaths.

The lecture was followed by a brief question and answer session wherein the attendees raised their doubts and Professor Churcher provided insightful responses to all the queries. The session concluded with a vote of thanks from Dr Sachin Sharma to the speaker and the attendees.

The recording of this lecture is available on the MERA-India website (https://www.meraindia.org.in/lecture-series).

Research in Spotlight

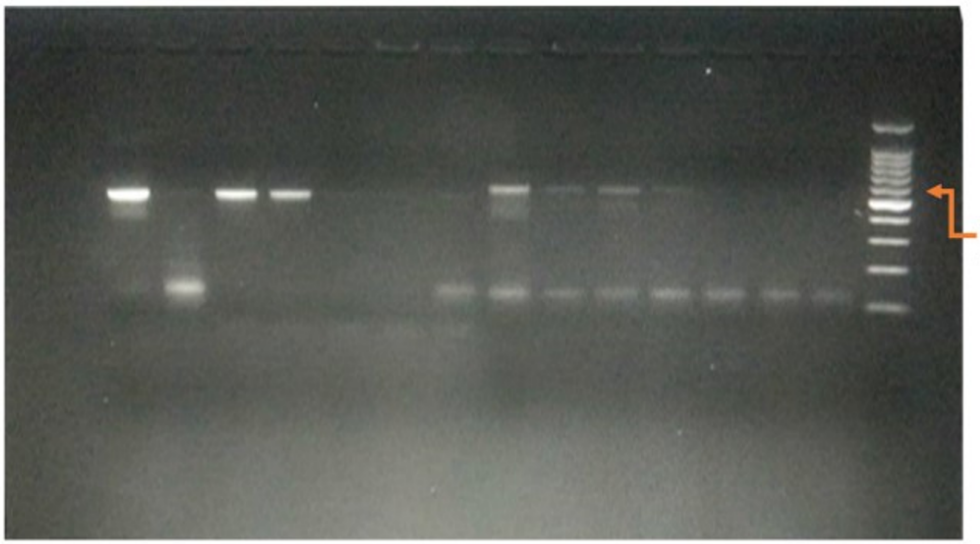
Lai *et al.*, *Trop. Med. Infect. Dis.* 2023: Evaluation of A Simple DNA Extraction Method and Its Combination with Loop-Mediated Isothermal Amplification Assays for Rapid *Plasmodium knowlesi* Diagnosis.



Source: https://www.mdpi.com/2414-6366/8/8/389/html

Recently, there has been a notable increase in the number of individuals infected with *Plasmodium knowlesi* in Malaysia and other parts of Southeast Asia. Initially, it was believed that only monkeys could be infected with this parasite, but since a case was reported in 2004, it has been adapting and infecting humans. This study by Lai *et al.* aimed to improve an existing loop-mediated isothermal amplification (LAMP) for the detection of *P. knowlesi* by using a simple DNA extraction approach. The method involved heating diluted infected blood at 95°C for 5 minutes to lyse blood cells and release DNA. This DNA was then utilized as a template for two fluorescent-based LAMP and one colorimetric-based LAMP assay. The detection limit for both SYTO-LAMP and SYBR green-LAMP was 0.00001% and 0.0001% parasitemia, respectively, while neutral red-LAMP had a detection limit of 0.01% parasitemia. Therefore, the study suggests that combining this simple, inexpensive, and purification-free DNA extraction method, SYTO-LAMP could be an alternative molecular diagnosis for the detection of *P. knowlesi* and other human *Plasmodium* spp.

Urassa *et al. Rwanda J. Med. Health Sci.* 2023: Prevalence of *Plasmodium falciparum* Gametocytes among Malaria Positive Cases at Korogwe District Hospital: The Use of Molecular Techniques in Comparison with Light Microscopy.

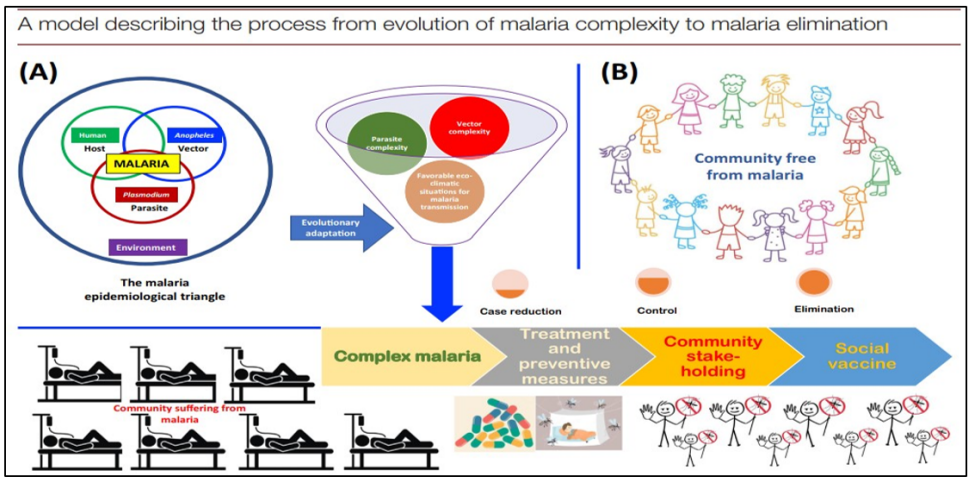


Key: P, Positive (Pfg27 gene was detected); L, Ladder; N, Negative (Pfg27 gene was not detected)

Source: https://www.ajol.info/index.php/rjmhs/article/view/252559

In a recent study, Urassa *et al.* recommended the use of conventional Polymerase Chain Reaction (cPCR) over light microscopy to detect gametocytes to effectively block the transmission of malaria. Gametocytes are the sexual precursor cells of the malaria parasite that mediate the transmission of the parasite from its mammalian host to the *Anopheles* mosquito. Light microscopy has been the most commonly used technique in clinical settings to detect gametocytes. Unfortunately, there has been a great underreporting of the presence of gametocytes among malaria-positive cases while malaria continues to spread among people across the communities. This study utilized archived samples of malaria cases from Korogwe district hospital in the Tanga region, Tanzania where malaria prevalence is 3.1%. *Plasmodium falciparum* gametocytes were detected using molecular techniques targeting the *Pfg27* gene essential for gametocyte production. A total of 174 participants were included in the study and the prevalence of *P. falciparum* gametocytes by microscopy was 9.8%; sensitivity and specificity were 35.6% and 99.2% respectively. While, the cPCR gave a prevalence of 25.9%, with a sensitivity of 94.1% and specificity of 81.5%.

Khan *et al. Trends Parasitol.* 2023: How can the complex epidemiology of malaria in India impact its elimination?

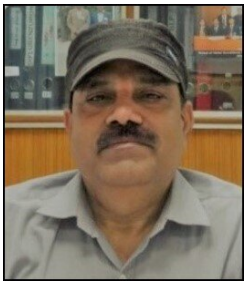


Source: https://www.sciencedirect.com/science/article/pii/S1471492223000673

This article discusses the challenges of eliminating malaria in India. Malaria epidemiology is complex in India due to the wide distribution of five species of human malaria parasites of the genus *Plasmodium* and ten different species of malaria vectors of the genus *Anopheles*. A wide distribution of drug-resistant *P. falciparum*, insecticide-resistant *Anopheles* vectors, mixed *Plasmodium* species infections in a single human, and rising numbers of asymptomatic *P. falciparum* cases create an environment conducive to malaria transmission, making malaria epidemiology highly complex. Moreover, human migration, and porous political borders with endemic countries, appear to further complicate the issues. Diagnosis of malaria in the field heavily relies on the rapid diagnostic test (RDT); however, this method is prone to false-negative results in *P. falciparum* diagnosis, which puts additional complexities over and above the 'epidemiological complexities'. Also, in the absence of defined treatment for asymptomatic and mixed malaria infections, the epidemiological outcome of *P. falciparum* malaria might remain elusive in the future. Khan *et al.* concluded the review with several multidirectional and multidisciplinary approaches that will help in devising implementable research toward the elimination of malaria with a focus on hard-to-reach areas (rural, forested, and tribal areas), where public healthcare facilities are scarce. Therefore, well-defined elimination plans for such specific vulnerable populations shall have to be prepared. The implication of suggested approaches in conjunction with the existing policies could prevent malaria infection locally and ultimately contribute to a great extent to achieving the targeted elimination in India by the year 2030.

Malaria Scientists to Watch

An interview with Dr K. Raghavendra



Dr K. Raghavendra
Scientist-G (Retired),
ICMR-National Institute of Malaria Research,
New Delhi, India

1. Kindly share insights from your nearly four-decade journey, spanning from your attainment of a PhD in insect toxicology to your involvement in various decision-making bodies.

My four-decade scientific career started in 1980 and was entirely in malaria research and precisely in Insecticides and Insecticides resistance and management and has always been relevant to the contemporary developments in this science in the laboratory and field. I obtained a PhD degree in insect toxicology from Delhi University in 1994 that investigated for the first time biochemical resistance mechanisms in a major malaria vector, *An. culicifacies.* Started my career in a National Malaria Elimination Programme-ICMR project from 1980-1982, later in MRC (NIMR), -Delhi as SRF till 1984, as a research scientist since 1985 in different grades up to scientist G till 2020, and lastly as Sr. consultant in 2021.

I was a member of different committees of the Ministry of Health and Family Welfare, Government of India (MoH&FW), National Center for Vector Borne Diseases Control (NCVBDC), and ICMR on insecticides and public health products (PHPs), technical specifications, and procurement committees. I was a member of the World Health Organization (WHO) working for groups on PHPs and guidelines drafting committee of interventions, coordinator for WHO Pesticide Evaluation Scheme (WHOPES) multi-country trials in India since 2000, member of the scientific committee of the Worldwide Insecticide Resistance Network (WIN) since 2016 and was Scientist-in-Charge of the WHO Collaborative Centres for laboratory evaluation of PHPs (2012-16-2020) and subsequently upgraded the laboratory for due GLP certification. Recently, I was an investigator of multi-country WHO studies for determining discriminatory dosages for insecticide resistance monitoring in mosquitoes and sandflies (2020-2023).

2. Could you please provide an overview of the current state of insecticide resistance in India, highlighting key vector species and geographic regions where this phenomenon is most prevalent?

Six primary vectors of malaria are reported in India with specific distribution and influence on transmission in different ecotypes. *An. stephensi* is considered an urban species and targeted with larvicides while others are rural vectors managed with adulticide Indoor Residual Spraying (IRS) and Long-Lasting Insecticidal Nets (LLINs). *Anopheles culicifacies* responsible for 2/3 of annual malaria cases in the peninsular states, were reported to be multiple insecticide-resistant to Dichlorodiphenyltrichloroethane (DDT) and malathion by the early 1970s, and in the last decade to pyrethroids in some areas. Available verified data on insecticide resistance in *An. culicifacies* for the period 1991 to 2016 from 105 districts in 17 states, reported resistance to at least one insecticide in 101 districts. Actually, control of malaria in India is *per se* control of the species. *Anopheles fluviatilis*, a vector in forested areas and foothills, is resistant to DDT in some states but has no serious implications for malaria control operations. *An. minimus*, *An. baimaii* in northeastern states, and *An. sundaicus* from coastal Andaman and Nicobar Islands are still susceptible to DDT and other insecticides.

A more recent ICMR task force study conducted during 2017-2019 in 328 villages of 79 districts in 15 endemic states of India, in seven peninsular and 8 North Eastern states, reported *An. culicifacies* resistant to DDT in 50 districts of the 52 districts (including 2 districts of Assam for the first time), to malathion in 27, and to deltamethrin in 17 of the 44 districts surveyed. DDT-resistant *An. culicifacies* in northeastern states, a new paradigm needs more studies to assess the impact of insecticide resistance on disease transmission. Intensity bioassay studies to assess operational relevance of commonly used insecticides in IRS/LLIN pyrethroid-resistant *An. culicifacies*, in malaria endemic districts of Madhya Pradesh and Odisha suggested continuing the ongoing interventions but prompted more such studies in other endemic states.

3. In your opinion, what are the most promising research directions or innovative approaches for tackling insecticide resistance in the coming years?

The effective strategy for managing insecticide resistance is rotation, mosaics, mixtures, and combinations of insecticides. Improved LLINs with synergist piperonyl butoxide-deltamethrin and insecticide mixtures from different classes with different modes of action such as deltamethrin + clothianidin mixtures for IRS and deltamethrin/permethrin + synergists for LLINs are found promising, though not registered in India, are important for malaria elimination. The combination of two vector control tools such as pyrethroid LNs, and non-pyrethroid IRS is another strategy with chance and choice for exposure and efficacy.

4. What is the significance of "common protocol" for the malaria community?

Vector control methods rely on organic chemicals as adulticides for indoor residual spraying, space spray, and long-lasting insecticidal nets, while for personal protection and larval control, larvicides and insect growth regulators are used. Field testing of such products is carried out in a multi-centric mode in variable eco-epidemiology (geographical

locations), employing scientific evaluation to ascertain their suitability for vector control and safety against non-target organisms. Effective products are registered with the Central Insecticide Board & Registration Committee, for use in public health by the NCVBDC. Hence, testing and evaluation need standardized and harmonized evaluation procedures and protocols for acceptance by regulatory agencies. The drafted “Common Protocol for Uniform Evaluation of Public Health Pesticides for Use in Vector Control” provides standard protocols to generate results through structured field evaluations that guarantee performance at the desired level for effective VBD management in the field.

5. From your viewpoint, what role does MERA-India undertake in the pursuit of India's objective to eliminate malaria, and how essential is its role within this context?

Malaria Elimination Research Alliance (MERA) India, launched in 2019 to respond to the research needs of the country to eliminate malaria from India by 2030, has gone a long way in addressing the issues through thematic projects, and the progress is visible. The onus it has identified for itself is being accomplished successfully on the ground and also in knowledge partnership with eminent workers through training workshops, distinguished lectures, and brainstorming sessions. These discussions and presentations ignite the interests and motivate young researchers and professional scientists alike to pursue their interests and strive towards the common goal of malaria elimination by date. MERA India is successfully steering the path to the goal by various means and supports and has a pivotal role in amalgamating the efforts towards malaria elimination.

An interview with Dr Yadlapalli S. Kusuma

Dr Yadlapalli S. Kusuma
Professor,
Centre for Community Medicine,
All India Institutes of Medical Sciences, New Delhi

1. *Please provide an overview of key milestones and notable experiences in your professional career*.

My journey commenced with my fieldwork experience in the rugged terrains of the Visakhapatnam district in Andhra Pradesh. I committed myself to the tasks at hand during this fieldwork and learned the local dialect from local school girls who assisted me in communication. Through their guidance, I gradually managed to establish connections with the local people. This initial interaction phase gave me a modest confidence to engage with these communities.

As an inexperienced researcher and budding scholar, I aspired to address contemporary issues which led to my decision to select my PhD research topic on the cultural epidemiology of blood pressure. In the subsequent years, my doctoral thesis and subsequent endeavours unveiled the epidemiological shift within traditional communities, underscoring the imperative of screening for non-communicable diseases among socioeconomically marginalized groups. My journey continued through the Council of Scientific & Industrial Research- Research Associateship at Utkal University, even amidst personal transitions, including marriage and parenthood. I maintained a hopeful disposition, leading to my eventual selection as an Assistant Professor at AIIMS, New Delhi, in 2005.

This milestone signified the start of a fresh chapter characterized by interdisciplinary academic endeavours and a novel social context. My role at AIIMS paved the way for future research through intramural grants, fostering research work within the first year of my tenure. These grants proved pivotal in rejuvenating my research fervor and enhancing my research aspirations and publications. Subsequent funding from ICMR, the Department of Science & Technology, and the Indian Council of Social Science Research propelled my research journey, facilitating collaborations with state and district health authorities, communities, and other stakeholders. Each grant application was an opportunity for further learning and growth. Heartfelt gratitude is owed to the funding agencies, partners, communities, and the young researchers who worked on these projects. In sum, my narrative is one of growth, persistence, and collaboration, enriched by diverse experiences and the unyielding support of those around me.

2. *In your opinion, what role does community engagement play in the success of malaria control programmes, and how would you foster effective community participation?*

Community engagement plays a pivotal role in malaria control programs. Without community involvement, programme success remains elusive, irrespective of its meticulous design. Yet, cultivating community participation is a formidable challenge, demanding a systematic and thorough approach devoid of shortcuts.

Traditional community engagement primarily aims at inducing positive behavioural shifts in response to health challenges such as malaria. Rather than imposing novel concepts on communities, it's imperative to fathom their existing knowledge and rationale. Furthermore, examining factors influencing prompt malaria treatment-seeking behaviours remains vital.

During dialogues with communities and key stakeholders, collaboration with local entities such as panchayat raj institutions and municipalities proves pivotal. This synergy facilitates effective communication among all partners, ensuring timely identification and fulfilment of community needs. Jointly delving into issues, devising solutions, and adhering to collectively-made decisions fosters a sense of ownership, subsequently spurring active

community involvement in malaria elimination endeavours, spanning vector control, personal protection, and treatment-seeking.

Acknowledging the necessities for services and behavioural shifts, exploring available resources, and fostering a harmonious environment become primary steps toward success. The key to inducing behavioural changes lies in fostering belief and trust within the community that combating malaria collectively is achievable. Sometimes, acknowledging community issues, instilling hope, and engaging in effective communication can catalyse participation. Aligning malaria control with community concerns and selecting feasible actions resonates as pivotal.

As emphasized by Professor Sarah Rifkin, involving people in exploring health consequences leads to behavioural change. Effective community participation strategies arise not remotely but through active engagement, understanding perspectives, and sharing concerns. Analyzing why communities struggle to utilize available knowledge and resources necessitates conversations with stakeholders, including researchers immersed in community collaboration.

In essence, successful community engagement hinges on ongoing interaction, understanding, and shared purpose.

3. *Malaria affects vulnerable populations disproportionately. How would you tailor interventions to address the specific needs of these groups, such as tribal inhabitants and migrants?*

To begin, a profound comprehension of the distinctive circumstances, challenges, cultural

nuances, and vulnerabilities inherent in the lives of tribal inhabitants and disadvantaged migrants is imperative. Focusing specifically on socioeconomically disadvantaged migrants, collaboration with employers and companies that employ them becomes paramount. Notably, employers relying on contract labour exhibit keen interest in preventive measures due to the tangible impact of illness on project timelines and budgets. Hence, they emerge as potential partners for malaria control initiatives. Simultaneously, local authorities can contribute to vector control efforts, while the people require education in behaviour changes to protect themselves from malaria. Effective communication, delivered in an understandable manner, interactive dialogues, and the provision of necessary resources assume pivotal roles. However, migrants are often unfairly held responsible for malaria transmission, necessitating a shift in perspective to recognize them as a vulnerable population and extend policy and programme benefits to them.

For any vulnerable population like migrants and tribes, timely healthcare access holds paramount importance. Establishing healthcare facility mapping in the region and arranging on-site healthcare through the existing system is essential. Effective communication to encourage personal protection measures is pivotal in current contexts, be it malaria-prone tribal areas or among migrant workers and their families. However, addressing structural factors and implementing structural interventions is vital for malaria eradication alongwith behavioural interventions.

In summary, addressing the unique challenges of tribal inhabitants and disadvantaged migrants requires deep understanding, collaborative partnerships, effective communication, behaviour change initiatives, and a simultaneous focus on structural interventions. This multifaceted approach is vital to achieving malaria control and elimination goals.

4. What guidance would you like to give young anthropologists engaged in the field of malaria research?

For emerging anthropologists, I recommend a comprehensive understanding of socio-political, cultural, and vulnerability contexts. Consequently, the tradition of embedding fieldwork practices since inception continues. Successful malaria elimination efforts hinge on community participation and inclusive partnerships. I urge budding researchers to embrace a strong commitment to research and self-belief in its potential to yield positive outcomes. Owing to these proficiencies, anthropologists stand out in health research, securing opportunities within institutions like ICMR and AIIMS.

Future anthropologists should equip themselves with distinctive skills, analytical acumen, and effective communication, and scientific and managerial proficiencies. Anthropologists possess the capability to collaboratively design strategies to curtail transmission. Reflecting on how social disparities render individuals vulnerable to malaria is central, informing both comprehension and the crafting of impactful behavioural and structural interventions.

Furthermore, upcoming anthropologists must cultivate familiarity with programme intricacies and gain insights into global strategies across diverse socio-political and cultural contexts. This knowledge enriches their ability to tailor context-specific approaches for addressing malaria. A grasp of constitutional provisions and safeguards applicable to specific populations is equally imperative.

In conclusion, a people-centric mindset forms the core of anthropological practice. Thus, aspiring anthropologists should integrate critical thinking, unique skills, and multifaceted knowledge to foster their distinctiveness in tackling malaria and related challenges.

5. How do you perceive the role of MERA-India in aligning with India's goal of malaria elimination, and how significant is its contribution within this framework?

The Malaria Elimination Research Alliance-India (MERA-India) stands as a commendable initiative aligned with India's ambitious malaria elimination target by 2030. This initiative employs a comprehensive approach to combat malaria, leveraging expertise and conducting interdisciplinary research through diverse teams across the nation. An exemplary aspect of MERA-India's success lies in its systematic provision of continuous training, orientation, and hands-on sessions to its research teams, supplemented by regular field visits from experts and mentors. This approach enhances ongoing research endeavours and nurtures human resources and skill development for future research and programme implementation.

MERA-India holds the potential to play a pivotal role in aggregating evidence stemming from its multidisciplinary research and harmonizing findings to facilitate context-specific scaling up. Additionally, the platform has effectively fostered critical partnerships among diverse stakeholders, synergizing efforts to achieve programme objectives. MERA-India's model could serve as a template for other health initiatives seeking to conduct interdisciplinary research and adopt multifaceted strategies incorporating robust community participation, thereby advancing disease control and health promotion.

I extend my heartfelt congratulations to MERA-India for their commendable work and convey my best wishes for their continued success in the journey ahead.

Malaria Through the Lens of Researchers

In the present issue, we are showcasing another shortlisted entry of the MERA-India Image Competition 2022, submitted by Poonam Saroha, a PhD Student at the ICMR- National Institute of Malaria Research, Delhi, India.

Image title: “School Children as Agents of Change”

A brief description of the image is as follows:
Sensitizing the students about the importance of mosquito breeding and empowering them as agents of change, who in order will spread awareness about the malaria vectors and their breeding habitats in their local communities.

Upcoming Event

Lecture Series on Infectious Diseases 2.0: Lecture 09 by Professor Michael C. Wimberly

The upcoming ninth lecture in the ICMR-NIMR and MERA-India "Lecture Series on Infectious Diseases 2.0", will be delivered by Professor Michael Wimberly from the Department of Geography and Environmental Sustainability, University of Oklahoma, USA. He heads the Ecological and Geospatial Research and Applications in Planetary Health at the University of Oklahoma. Professor Wimberly's research focuses on the impacts of environmental change on ecosystems and human health through landscape, regional, and global analyses using satellite remote sensing and other sources of environmental and epidemiological data.

The lecture is scheduled for 12th September 2023, and we encourage you to stay updated on the event details through our official website (https://meraindia.org.in) and our social media accounts. We look forward to your participation in this informative session.

To receive regular updates about the events being organized by MERA-India, please subscribe at https://www.meraindia.org.in/event_sub.

Our mailing address is: meraindiaicmr@gmail.com
MERA-India Secretariat, Room No. 344, ICMR-National Institute of Malaria Research, Sector 8, Dwarka, New Delhi, 110 077, India
Telephone: 011-25307344
Website: https://meraindia.org.in