



NEWS & VIEWS

Issue 08, June 2021

Upcoming events

Lecture Series on Infectious Diseases

Keynote Lecture by



Prof Adrian Hill Director, The Jenner Institute, University of Oxford, UK **Editorial**

NIMR COVID-19 helpline

Guest Commentary by Dr Sanghamitra Pati & Dr Madan Mohan Pradhan

Research in Spotlight

Malaria Scientists to watch this month Dr Chandra Shekhar Lal & Dr Soumyananda Chakraborti

Announcements

Malaria Elimination Research Alliance-India









MERA-INDIA Newsletter 'News & Views' June 2021

Editorial

Dear readers,

MERA-India newsletter "News and Views" was launched by Professor Balram Bhargava, Director General-ICMR, on the occasion of ICMR-NIMR Annual day in November 2020.

It is our constant endeavor to bring to you the opinions and experiences of the experts and young researchers working in the field of malaria, and to highlight the latest developments and research related to malaria. Through the newsletter, we also highlight the activities being done by MERA-India team at NIMR and keep you informed about the upcoming events being organized by MERA-India.

In the previous issues of our newsletter, we had very insightful pieces for the 'Guest Commentary' section as well as inspirational interviews from scientists working in the field of malaria. The NIMR activities section included the public outreach programs to increase the community awareness and participation towards mosquito control and malaria prevention; the activities to survey and control mosquito population and the different malaria diagnostic strategies being used in India. In the most recent issue, we also provided the key highlights from the International Malaria Symposium which was organized by MERA-India on the occasion of World Malaria Day in April 2021 and appreciated by the scientific community. In case you have missed our previous issues, you can read them now at https://www.meraindia.org.in/newsletter.

MERA-India team now presents to you the eighth issue of our newsletter.

From this issue onwards, we are starting an editorial section in the newsletter, to briefly introduce the contents to our readers.

The last few months have been very challenging for all of us. COVID-19 pandemic has affected all of us, in some way or the other. In India, we are still recovering from the impact of the second wave of infection. The MERA-India team, along with the staff at NIMR Delhi, was actively involved, to the best of our capabilities and resources, in supporting the efforts of the Government to help the people. We had formed an Emergency Task Force at NIMR, and many staff members worked day and night, whenever required. NIMR was also at the forefront to manage and ensure the timely delivery of the COVID-19 RT-PCR detection kits to the whole of North India. A COVID-19 RT-PCR testing facility was also established at NIMR. In addition to this, we were also running helplines for the NIMR staff, their families, and extended all possible help to everyone. In this issue we have presented some of these efforts through a few pictures.

In the current issue, we have the 'Guest Commentary' from Dr Sanghamitra Pati (Director & Scientist-G, ICMR-RMRC, Bhubaneshwar) and Dr Madan Mohan Pradhan {Additional Director Health Services, ADHO (VBD), Department of Health & Family Welfare, Odisha}, through which the readers will learn about the impact of COVID-19 pandemic on the malaria management and elimination goal, with a focus on Odisha. We thank Dr Pati and Dr Pradhan for this informative commentary which brings to focus the concern of the malaria researchers in the current pandemic times.

For the 'Malaria Scientists to Watch' section, we interviewed Dr Chandra Shekhar Lal (Scientist-F, ICMR-RMRIMS, Patna) and Dr Soumyananda Chakraborti (Ramalingaswami Fellow, NIMR, Delhi) to learn more about their research and interests. We hope that our readers will find these interviews motivational.

In the 'Research in Spotlight' section, we have highlighted four recent research papers from the field of malaria, which we feel are of significance to the field and our readers will find them interesting to read. We compliment the authors of these studies on these novel and important findings.

In the 'Upcoming Events' section, you will find the details of the upcoming 'Lecture Series on Infectious Diseases' being organized by NIMR & MERA-India. The first lecture of this series will be the Keynote Lecture and will be delivered by Professor Adrian Hill, University of Oxford, on 21st June, 2021 on the topic 'New Vaccines for Malaria Prevention' (https://nimr.webex.com/nimr/j.php?RGID=r659502c387238e3501d04d85fb31bd46). We look forward to having all of you to join this series of 12 talks from renowned Indian and international scientists.

In the 'Announcements' section, we have made a call for graphical abstracts from PhD students working in the field of malaria, for an upcoming section, 'Early Career Malaria Researcher', in our newsletter which would be specifically dedicated to the PhD students. We hope that this section would provide a platform for PhD students to showcase their

research. We look forward to the contributions from the PhD students for this section.

We hope that you will find this issue informative and will enjoy reading it.

We would love to hear your feedback and suggestions towards the content of the newsletter. Please write to us at mercape:merc

With best wishes MERA-India team

ICMR-NIMR Activities: COVID-19 helpline for the NIMR staff



NIMR COVID-19 helpline for the NIMR staff and family. During the recent second wave of the COVID-19 pandemic, NIMR launched a helpline to help NIMR staff and their family members. This helpline was formed with an aim to provide all the help related to arranging consultation with doctors, providing medicines and oxygen cylinders as needed, assisting with hospital admissions for critical cases and providing ambulance facilities where and when required. a. The NIMR COVID-19 medical kit included essential medicines, thermometer and oximeter b. A vehicle was converted to an ambulance, and was used to shift critical patients from their home to hospitals. c. The ambulance was also equipped with an oxygen cylinder for the patients during the transit from home to hospital. d. Oxygen cylinders were procured by NIMR to support the NIMR staff members facing critical COVID-19-related health issues.

Guest Commentary

Achieving Malaria Elimination Goal Amidst COVID-19 Pandemic in Odisha, India: Way forward 2021

Madan Mohan Pradhan MBBS, MAE-FETP ¹, Sanghamitra Pati, MD, MPH ²

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The global malaria situation is at the crossroads with less than 2% decline in malaria incidence between 2015 and 2019. An estimated 229 million malaria cases and 409,000 malaria deaths occurred globally in 2019 according to the World Malaria Report 2020. India is the only high burden country across the world that recorded 17.6% decline in malaria incidence between 2018 and 2019. Odisha, one of the eastern coastal states, which accounted for more than 40% of malaria case burden of India in 2016, is at present the major shareholder of this phenomenal success with a 90% reduction in malaria cases since 2016. Compared to 2018, Odisha recorded more than 40% fall in malaria cases in 2019, the second highest among all the states and union territories of India. Out of its 30 districts, prime contributors of malaria cases are the southern, western and northern districts of the state. These districts are mostly covered with vast forests and hilly terrains and have a higher percentage of tribal population.

The geo-ecotype and the tropical climate with high temperature, high humidity and rainfall create conducive malariogenic environment by providing vector mosquito breeding sites, favourable proliferation conditions to the vector population during monsoon and post monsoon seasons along with the development and proliferation of malaria parasites. The geo-eco types, deep forest areas and hilly terrains cause difficulty in accessing the remote hilly and forest villages. In forest and hilly terrains, there are perennial streams giving abundant opportunities for continuous breeding of malaria vector mosquitoes. The presence of efficient Anopheles mosquitoes (*Anopheles fluviatilis*) causes persistent transmission of malaria in such areas. The load of *Plasmodium falciparum* (Pf) parasite is quite high in Odisha (85 to 90%).

Malaria burden and transmission vary from region-to-region in the state. The southern districts under KBK (Koraput-Bolangiri-Kalahandi) region followed by the northern and western districts have high malaria transmission due to Pf species. In contrast, the coastal districts have demonstrated very low incidence of malaria over the decades except in a few clusters of forest fringed villages/ hamlets. In these districts, proportion of *Plasmodium vivax* (the second malaria parasite species in the state) is around 60%. Malaria is being addressed in India and Odisha under the National Vector Borne Disease Control Programme (NVBDCP), which addresses six vector borne diseases (VBDs): Malaria, Lymphatic Filariasis, Dengue, Chikungunya, Japanese Encephalitis and Kala-Azar.

In Odisha, malaria continues to remain a major public health challenge since ages showing a prevalence in all 30 districts, though of varying intensity. In the past many decades, the state used to account for a considerable share of malaria cases and deaths in India. In 2002, there were more than 400 reported deaths due to malaria and then constricted to 200-300 in subsequent years. Recently, due to intensified control measures and state's own innovative strategy, a substantial reduction in malaria morbidity and mortality has been

witnessed. In 2014, there were around 0.4 million malaria cases, which dramatically declined to around 40,000 in 2019 with commensurate fall in the number of deaths from 89 in 2014 to 9 in 2019.

In 2020, the onset of COVID-19 pandemic necessitated the diversion of bulk of the public health resources in most of the states of India to contain the catastrophe, thus posing a significant burden on the primary health care system. The malaria control measures, especially malaria surveillance was impacted across the country in 2020. However, the Health and Family Welfare Department of Odisha successfully contained the spread of COVID-19 infections through 2020. During 2020, Odisha contributed only about 3% of COVID-19 burden of India. However, malaria transmission increased in Odisha in 2020 till the mid of the year. While the other category 3 states of India recorded a reduction in malaria positivity rate, Odisha recorded an increase in malaria positivity rate by more than 17%. At the same time, the blood examination rate decreased in Odisha during 2020 as compared to 2019.

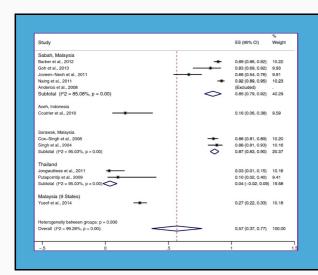
The second wave of COVID-19 in 2021 is having a high transmission rate which has caused a surge in COVID positive cases and related deaths. The primary health care set up in all the districts of the state is overwhelmed with the escalation of COVID situation. With human resource constraints in the health system, there is always a need to mobilize the vector borne disease staff for COVID related tasks as per the situation. Besides, given the restriction on social gathering, and prevailing COVID-19 appropriate norms, many community level activities for malaria related health awareness, conducting indoor residual sprays, monitoring the regular use of long-lasting insecticidal nets, and malaria specific supervision activities get hampered.

Though malaria incidence in Odisha till the end of May 2021 shows a downward trend as compared to 2020, there could be a looming apprehension of the potential impact of COVID-19 on malaria from June to December 2021. In the second wave of COVID-19, increasing number of infections are being detected in rural areas and most potentially highrisk malaria endemic districts have very high positivity rate of COVID-19 too. Between January to June 2021, the number of COVID-19 cases in Odisha more than doubled as compared to the total cases in 2020. In the month of May 2021, the state witnessed on an average about 10,000 cases per day, with active transmission still continuing till June 2021. Further, it is also apprehended that there could be a possibility of third wave after an interval of a few months. This indicates that the same primary health care system which was entrusted to address the malaria surveillance and undertake malaria prevention and control measures might remain engaged in COVID management during the peak transmission season of malaria and thus antimalarial interventions may get affected during the monsoon post monsoon months. Maximum surveillance and point of care testing for malaria is being done by the frontline village health volunteers i.e., ASHA supported by the Anganwadi Workers (AWW) and sub-centre level Health workers (HW). ASHA, AWW and HWs are also the frontline COVID workers. They have to move with all the precautions adopting COVID-19 appropriate behavior while conducting COVID related surveillance (ILI/ SARI) and managing the health care needs of the rural residents affected with COVID. Maintaining the restricted work style may divert their attention to address malaria at the community level.

In view of the malaria elimination goal to be achieved by 2030 and the lower-than-expected pace of activity amidst the COVID-19 pandemic, the primary health care system has to be re-strategized accordingly and the activities need to be synergized. This requires strengthening of malaria testing, increasing active surveillance, better coverage of mass screening under the DAMaN programme, and an integrated awareness campaign for COVID-19 and malaria leveraging the Malaria-Dengue-Diarrhoea (MDD) campaign and COVID-19 related awareness programme in the state. Greater focus may be shifted to digital surveillance and an early detection and control of malaria upsurges during the

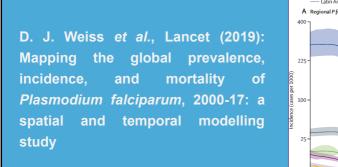
transmission season. In Odisha, a proactive welcome step has already been adopted by the Government to address malaria amidst COVID-19 by introducing an integrated surveillance drive in which malaria has been included. Improved timeliness and an enhanced adoption of technology would further catalyze the impact of integrated surveillance of malaria and COVID-19 in Odisha.

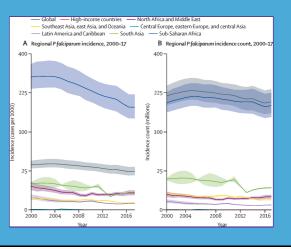
Research in Spotlight



Mahittikorn et al., Scientific Reports (2021): Comparative performance of PCR using DNA extracted from dried blood spots and whole blood samples for malaria diagnosis: a meta-analysis

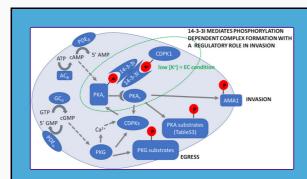
In this study, <u>Mahittikorn et al.</u>, compared the sensitivities of PCR techniques using different source materials such as whole blood or dried blood spots (DBS) to detect malaria parasites. The authors analyzed seven out of 904 studies retrieved from databases such as PubMed or Scopus. The detailed and combined meta-analysis revealed that there is no significant difference in the relative performance of PCR studies conducted using DBS or whole blood samples. However, at a sub group level, PCR reactions performed using DNA extracted from DBS samples have less accuracy at detecting *P. vivax* as compared to whole blood samples.





In the study by <u>Wiess et al.</u>, the authors have shown the global trends for *Plasmodium falciparum* incidence, for the period between 2000-2017. The authors have also generated detailed global maps quantifying the high-resolution spatiotemporal patterns of *P.*

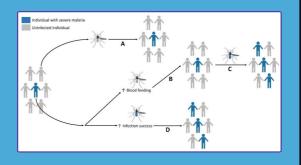
falciparum burden and mortality. These maps will help assess the success of the intervention efforts in localized regions as well as will highlight the areas of concern. Despite an increase in population, there has been a decline in the malaria incidence and deaths since 2005, however, a large population still resides in endemic regions and is at risk. Submicroscopic infections and low density parasitemia are major contributors to the persistent transmission and infections. These results will highlight the geographical regions which need attention and help identify the gaps to meet the challenges to eliminate *P. falciparum* globally and also allow the international funding community to be resolute in their efforts to eliminate the disease.



Lasonder, E. et al., Frontiers in Microbiology (2021): cAMP-Dependent Signaling Pathways as Potential Targets for Inhibition of Plasmodium falciparum Blood Stages.

In the above article by <u>Lasonder</u>, <u>E. et al.</u>, (2021), the authors have proposed the targeting of cAMP-PKA-signaling as a therapeutic approach against the diseases caused by apicomplexan parasites, including malaria. The authors have elaborated the role of cAMP/PKA signaling in erythrocyte invasion by *Plasmodium* merozoites, and its contribution to the pathogenesis of different apicomplexan parasites. A scheme for malaria parasite specific enzymes involved in cAMP-PKA signaling has also been provided. The authors have proposed that pharmacological manipulation of cAMP levels and blockade of PKA-mediated signaling could be an effective therapeutic strategy against apicomplexan parasites.

Rodriguez et al., Biomolecules (2021): Histamine Ingestion by Anopheles stephensi Alters Important Vector Transmission Behaviors and Infection Success with Diverse Plasmodium Species



Patients displaying severe malaria exhibit up to 10-fold higher histamine levels in their blood. In the above study by Rodriguez et al., the authors have shown that the ingestion of high histamine levels during the blood feeding from such individuals, can affect the physiology and behavior of the malaria vector Anopheles stephensi. These changes included increased flight activity and enhanced responses to the host cues resulting in an increased parasite infectivity of the mosquitoes and an enhanced transmission to the host. Histamine is an insect neuromodulator and the results from this study suggest that an alteration of host histamine levels can be used for malaria control.

Malaria Scientists to watch

An interview with Dr Chandra Shekhar Lal



Dr Chandra Shekhar Lal,
Scientist-F & HoD,
Microbiology & Central Diagnostic Lab,
ICMR-RMRIMS, Patna

1. Kindly let our readers know how did your research career begin and what has been the biggest driving force in your life to become a skilled infectious diseases scientist?

My research career began as Research Assistant (RA) in ICMR-RMRIMS, Patna. Being the beginner in the research, I frequently asked research questions, without any hesitation, to my senior colleagues and also actively participated in scientific meetings/seminars. The curiosity, vigor, ideas and research questions, whether relevant or irrelevant, gradually helped me in understanding the research questions and increased my confidence to become a scientist and undertake any research problem.

2. What has been the most crucial impact of your clinical and scientific research so far that is inspiring for young researchers?

The most crucial impact of my clinical research has been the development of first ever oral drug (Miltefosine) for treatment of kala-azar patients by participating as one of the laboratory investigators in the Phase III/IV drug trial of Miltefosine. Another clinical drug trial of injectable Paramomycin (Phase III/IV) in kala-azar patients was carried out in which I worked as the laboratory director. The rigorous monitoring of laboratory parameters during the clinical trial was assessed by WHO and internationally acclaimed clinical monitors which further increased my confidence and enthusiasm in research. Another of my most cited scientific research has been on lipids which identified cholesterol & triglyceride as possible diagnostic markers in understanding the severity of kala-azar disease.

3. What are the research gaps that you think require urgent attention in eliminating lethal diseases such as kala-azar/leishmaniasis/malaria from India?

The disease scenario keeps on changing and hence the researchers should keep a close watch on the present emerging situation and based on that frame the research questions and, execute the research plan. The individual scientific approach in the elimination of lethal diseases like kala-azar/or malaria from India will be tough, rather, a composite/ joint or

collective approach of all stakeholders will be more useful. The unified approach in regard to host, vector and its epidemiology will provide impetus in tackling these diseases.

4. Other than cutting-edge scientific research, we would like to know whether you have any other research interests.

My other research interest has been tuberculosis. The COVID-19 pandemic has also stimulated my research interest towards it.

An interview with Dr Soumyananda Chakraborti



<u>Dr Soumyananda Chakraborti,</u>

Ramalingaswami Fellow (Scientist-D, DBT),

ICMR-National Institute of Malaria Research, New Delhi

1. Could you please describe your scientific background and journey that contributed to you becoming a budding malaria scientist?

I started my scientific carrier as a PhD student at Bose Institute, Kolkata under the guidance of Professor Pinak Chakrabarti and I graduated in 2013. My graduate studies were directed towards understanding the mechanism of the protein-nanoparticle interaction. During my PhD studies I explored how nanoparticle size and surface chemistry regulates various physico-chemical parameters of proteins. In parallel, I was also trying to understand how tubulin interacts with different anti-cancer drugs. Tublin/microtubule proteins are one of the key regulators of eukaryotic cytoskeleton and considered as an important anti-cancer target. I have identified tubulin to be an important biological target of curcumin (a traditional Indian medicine found in the spice turmeric).

I was so fascinated by tubulin that I decided to explore this protein in more details and that is the reason I moved to Institut Curie, Paris as a postdoc researcher. In Institut Curie, I was addressing one of the fundamental questions of microtubule biology; how different tubulin isoforms and modifications are involved in the regulation of microtubule functions. Though the project was very interesting, however it required lot of cell biology related research. After a year of pursuing this research, I realized that I am not a good fit for cell biology-oriented research, as my previous training was in protein biology and biophysics. So, I decided to move and joined a new lab in USA.

My main research theme in USA lab was to develop protein cage based functional nonmaterial. I was particularly involved in encapsulating protein within virus-based protein cages and developing VLP based materials. During this tenure, I was trained in many cutting-edge techniques of protein engineering, virology and bio conjugation techniques, which I am still pursuing. During my tenure in USA, I saw an advertisement from Poland

where they were looking for someone, who has experience in protein engineering and structural biology. The group was offering an assistant professor position, with high level of independence, which I was missing in the lab in USA. Though I hesitated initially, however, finally I decided to join the lab and returned to Europe once again and started my carrier as an assistant professor. In Poland, I mostly worked on bio-nanotechnology/synthetic structural biology with a specific aim of developing protein based functional nanomaterials for smart drug delivery and vaccine development. Interestingly, within a few months of joining my lab, I received a very prestigious "HOMING" grant from the Foundation for Polish Science (FNP) to conduct my own research in synthetic structural biology. I spent almost 4 years in Poland and my tenure was pretty successful, with several high-impact publications, including one in *Nature*. In last August, I joined NIMR as a Ramalingaswami fellow and presently I am pursuing several research projects related to structural biology and vector control.

2. Enlighten us with the significance of your most valuable research so far in the field of public health research?

Most of my research so far has been related to basic science, although I have determined protein targets of few anti-cancer molecules and developed smart nano-robots for targeted delivery, however, their efficiency have not been validated clinically. After joining NIMR, I have started working on projects which have more impact on public health. My current research at NIMR is focused on structural understanding of mosquito proteins involved in crucial biological regulations, such as protein translation, host recognition and iron transport. Understanding structure function relationship of these key regulators holds great promise in designing selective inhibitors against them and perhaps in the long run they might also serve as effective insecticides. Hence, my structural studies are important for vector control and malaria elimination. Apart from research work already mentioned, I am also involved in establishing a state-of-the-art structural biology core facility at NIMR. This is the first time any ICMR institution would have such kind of facility. So, we can expect this facility would boost basic scientific infrastructure and research capabilities of NIMR as well as of ICMR.

3. Please describe your additional scientific interests other than malaria research?

Apart from the projects mentioned above, I am presently pursuing a project related to COVID-19, where we are trying to understand transmissibility and virulence of different corona-virus variants, from a structural perspective.

4. Other than cutting-edge scientific research, we would like to know whether you have any other research interests.

Well, I am very interested in DNA origami and protein nanotechnology related research, also research related to "ageing" attracts me a lot.

5. Finally, on a lighter note, do you have hobbies other than science that have always kept you motivated during your research career, especially during tough times?

I have many including travelling, photography, watching documentary, I am also a numismatist.

Upcoming events

Lecture Series on Infectious Diseases



NIMR & MERA-India present Lecture Series on Infectious Diseases June 2021 - May 2022





We commemorated World Malaria Day 2021 by conducting International Malaria Symposium. In continuation, NIMR and MERA-India are now organizing a Lecture Series on Infectious Diseases. The lecture series will be held as an online event with 12 lectures between June 2021 and May 2022. The talks will be delivered by renowned Indian and international scientists, who will be speaking on a wide range of topics in infectious disease research. We invite everyone to join us to listen to the inspiring and motivating talks by these speakers.

The lectures would be held on a monthly basis and would be free to join. The lecture title and the registration link would be shared before each scheduled lecture on both the NIMR and MERA-India websites, Twitter, Facebook and LinkedIn. If you would like to receive regular updates related to this lecture series regarding the talk title and the opening of registration for each lecture, please subscribe using this link: https://forms.gle/GKYJUzNUXaZ7SbMf6

The first lecture of the series will be the Keynote Lecture by Professor Adrian Hill, University of Oxford, on 21st June, 2021, who will be speaking on "New Vaccines for Malaria Prevention". To register for this lecture, please visit:

https://nimr.webex.com/nimr/j.php?RGID=r659502c387238e3501d04d85fb31bd46



Announcements

Early Career Malaria Researcher: Call for Graphical abstracts from PhD students

Based on the feedback from our readers, we are starting a section, 'Early Career Malaria Researcher', in the newsletter to specifically highlight the research findings from the PhD students working in the field of malaria. This section would include a graphical abstract and a brief description (about 150 words), along with a picture of the PhD student and the supervisor. The graphical abstract should be original and can be based on the findings of the entire PhD thesis or any specific section. The purpose of this section is to provide the PhD students with a platform to share their research findings with the global scientific community.

To submit your contributions for this section or in case of any queries please write to us at meranewsletter@gmail.com.

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