

CSCMI
Center for the Study of Complex Malaria in India
Meghalaya

**Indian Institute of Public Health Shillong
National Lutheran Health & Medical Board (NLHMB/MLCU)
New York University, USA**

Summary of Year 1 activities & progress, Sept 2017 - March 2018

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Background and Center goals

Despite its decline over the past decade, malaria remains an important global public health burden in India. The hilly, wet and rugged northeastern state of **Meghalaya** is classified as one of the ten ‘high transmission’ states in the country, with an annual parasite incidence of 2.4 per 1,000 in 2014 (**Fig. 1**). Malaria control in Meghalaya has long been problematic, although there has been a decline in malaria over the past couple of years, much work still needs to be done in our quest for eventual malaria eradication. Despite its importance as a threat to public health, there is a paucity of malaria research and surveillance data in the state, and vector studies have been few and sporadic.

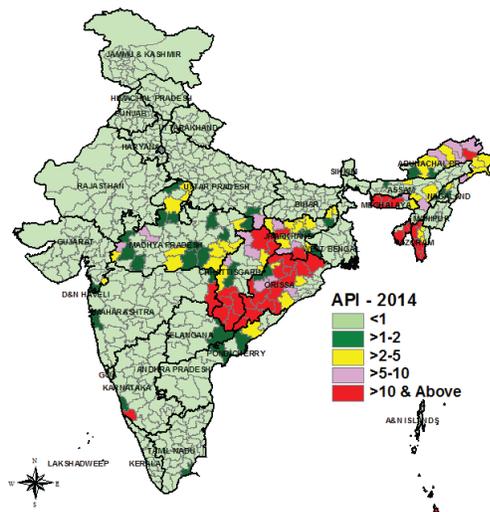


Fig. 1. Geographic distribution of malaria incidence (API) in India in 2014. Taken from [1]. There has been a 79% decrease in incidence of malaria in India for the period 2000-2014 [2], although there is controversy about the reliability of the national data [3, 4]. The NVBDCP aims to have at least 80% of high risk groups (defined as people living in an area with an API of > 2) to be protected by insecticide treated nets (ITNs) or indoor residual spraying (IRS) by 2017 as part of their **Strategic Plan for Malaria Control in India** [5].

The overall goal of CSCMI is to characterize the prevalence and genetic diversity of different malaria parasite species and their *Anopheles* vectors. Such ‘**complex malaria**’ impacts the epidemiology, transmission, and clinical manifestation of the disease, and is thus key to understanding malaria in India. An important second goal is to train the next generation of malariologists in Meghalaya in techniques such as molecular biology, genomics, immunology, satellite mapping and modeling, as well as transfer of novel technologies, and capacity building.

To achieve these goals, we have developed a **series of epidemiological studies**, including (i) community-based cross-sectional studies that focus primarily on estimating the prevalence of malaria, (ii) community-based cohort studies to monitor the outcome of asymptomatic falciparum malaria, and (iii) hybrid cross-section-community studies to assess the burden of recurrent vivax malaria. To complement the human and parasite sampling, we will also undertake ***Anopheles* mosquito studies**, such as adult and larval collections to identify competent species, testing for insecticide resistance, and looking at feeding behavior.

Ethics Approval

Initial ethics approval was obtained in February 2018 from the MLCU UREC. Study modifications were submitted and approved prior to initialization of changes in September and November of 2018.

Project progress

1. Stakeholder engagement meeting, Shillong, Meghalaya, 22 September 2017

We undertook a stakeholder meeting to introduce the state and local government health officials and other regional academic/research organizations to the CSCMI 2.0. Shri P.W. Ingti IAS, Additional Chief Secretary, Health & Family Welfare Dept., Government of Meghalaya was the Chief Guest. Dr. R. Lyngdoh, Deputy Director of Health Services, NVBDCP, State Health Society, NHM, Meghalaya provided an overview of malaria in Meghalaya. Shri Ingti said that this was an important initiative for Meghalaya and extended the support of the Dept. of Health & Family Welfare for the various studies to be undertaken by the Centre. The Director of Health Services – MI, DHS-MCH and several representatives from the GoM Department of Health & Family Welfare (H&FW), from academic institutions like NEIGRIHMS, MLCU, NEHU, from ICMR Dibrugarh and others also graced the occasion.

Malaria study centre launched in City

GUARDIAN NEWS BUREAU SHILLONG, SEPT 24. A stakeholder engagement and launch event was organized by the Indian Institute of Public Health Shillong (IIPHS) in collaboration with the state Health & Family Welfare department, at the State Convention Centre in Shillong. The Centre for the Study of Complex Malaria was launched by PW Ingti, Additional Chief Secretary, Health & Family Welfare Dept. The project in Meghalaya is part of the International Centres for Excellence in Malaria Research (ICEMR) initiative, funded by the National Institutes of Health, USA. The Centre for the Study of Complex Malaria in India (CSCMI) will be established at the IIPH, Shillong under the leadership of Prof. Jane Carlton (New York University) and Prof. Sandra Albert (IIPH, Shillong). Through this centre, leading researchers from prestigious institutions from across the world such as New York University (NYU), USA, the University of Manchester, UK and senior scientists from the Indian Council of Medical Research (ICMR) will be mentoring young researchers from Meghalaya and the northeast region so that locally relevant research is done and research capacity in the state and region is strengthened. Ingti welcomed the initiative and

remarked that this is a "red letter day for malaria research in Meghalaya". He said as stakeholders all the concerned officials of the Department of Health and Family Welfare should extend their full support to make the Centre's activities a success.



Dr. R. Lyngdoh, Deputy Director of Health Services (MI cum SPO), NVBDCP Meghalaya provided an overview of the malaria situation in Meghalaya. She highlighted the successful initiatives of the department that have helped in reducing malaria incidence over the past year and said that much remains to be done in bringing it down further. Among all malaria-endemic areas of Meghalaya, Garo Hills consistently suffers from the highest rates of malaria cases and deaths.

Dr. Sandra Albert, Director, Indian Institute of Public Health Shillong, highlighted the importance of research in informing policy and actions.

The research undertaken by the Centre would focus on the epidemiology and clinical aspects as well as on Plasmodium the causative parasite and mosquitoes that are the vectors. A special focus would be on understanding the magnitude of asymptomatic carriers of the parasite in the community; persons who carry the causative agent but does not manifest any symptoms of malaria. Dr. Jane Carlton, Director, Centre for the Study of Complex Malaria in India & Director Centre for Genomics & Systems Biology, New York University, USA, provided

an overview of CSCMI and implications for study of Malaria in Meghalaya.

The Centre will develop state-of-the-art laboratory facilities and introduce new molecular and genomic technologies to identify malaria parasites and the mosquito vectors that are transmitting them. The overall goal is to develop better methodologies to control the burden of the disease in the people of Meghalaya.

Dr. Anna Maria van Eijk, Epidemiologist, New York University, discussed the proposed epidemiological studies of Malaria in Meghalaya.

Dr. Catherine Walton, University of Manchester, UK explained the importance of understanding mosquito diversity for malaria control in North East India. "Mosquitoes are also evolving and changing and we need to be able to understand the phenomenon to better control and reduce disease burden in the future. There is an urgent need to survey the breeding habitats and to understand the biting behaviour to make the vector control more effective," she said. Although numbers have fallen in recent months, much work still remains to be done and health teams face considerable challenges in implementing malaria control measures in the field, she added.



2. Field study sites, September 2017

We spent 3 days undertaking field visits to West Garo Hills and Jaintia Hills to meet with district and local health workers and identify villages with a high burden of malaria to start our epidemiology studies. In consultation with the officials of the Dept. of H&FW, GoM, **Nonglang in West Khasi Hills** and **Barato in Jaintia Hills** were identified as the best areas/villages to start with.



3. Personnel training, and visiting Nongstoin DMHO, January 2018

One field team of 4 personnel were trained for work in West Khasi Hills; in research ethics, malaria diagnosis, lab safety, GPS capture etc. Renovation and equipping of the new laboratory and office spaces are underway, and equipment, supplies and infrastructure are being purchased/developed. We took a field trip to visit the District Medical & Health Officer of the Nongstoin Civil Hospital and presented our plans for CSCMI in front of ~ 30 local medical doctors attending a 2 day training course on malaria. We visited Nonglang PHC to meet with the medical officials and their team, and determine logistics of rolling out the epidemiology and transmission study.

4. Workshop on satellite imaging, modeling, and social network analysis, January 2018 in Shillong

We ran a workshop with a team from University of Manchester to look at social networks and GPS/satellite mapping, and discuss possibilities of modeling malaria prevalence data with IRS and LLIN data.

5. Training sessions for the local field team

In March 2018 Dr Anna Maria VE and Dr Annie Kessler held additional training sessions for the local field team and supported them in rolling out a pilot of the epidemiology census and cross-



sectional surveys at the West Khasi Hills field site Nonglang.

Awareness building session with ASHAs at Nonglang PHC

Prior to working in the community, the team had interacted with the headman and village elders for providing information and seeking permission.



6. Meeting at DHS called by the Secretary Health

a meeting was called at the Directorate of Health Services for discussing CSCMI progress and modalities of working with the GoM



7. Field Work

March-April 2018: Pilot study of the epidemiology household cross-sectional survey was initiated at Langja village, West Khasi Hills from March 12-14 2018

On March 26, 2018 representatives of the CSCMI team attended the international panel of the Scientific Advisory Group (SAG) held in Seattle, USA. A supplementary grant application for which the team can apply for additional funding from NIH for field work was discussed. As the malaria rates are falling it was suggested that the future study in Meghalaya try to focus on social sciences aspects pertaining to 'malaria elimination strategy' that look at community beliefs, attitudes and practices relevant to malaria and control initiatives of the government (NVBDCP). This is to help address gaps in knowledge that can be used in a future elimination strategy that may be developed over the next few years.

Field data collection initiated in Kriangrin village, WKH from 23-28 April. Samples collected from 35 households and 108 participants are being processed currently.

June- November 2018: The field team comprises of the Epi and the Vector teams. The field teams have completed rounds 1 and 2 of data and sample collections from West Khasi Hills (Nonglang) and West Jaintia Hills (Barato). The West Khasi Hills Epi team have enrolled 333 Households with a total of 1202 individuals from 12 villages. From the samples collected 12 were PCR positive and one RDT positive.

Similarly in the West Jaintia Hills, the Epi team has enrolled 468 households with a total of 1478 individuals from 9 villages. From the samples collected one sample was PCR positive.

Clinic enrollment was initiated in the month of September 2018 to ensure enrollment of individual attending the PHC with signs and symptoms of malaria. Till date 14 clinic samples have been collected from Nonglang PHC and 11 Clinic samples from Barato PHC respectively.

8. CSCMI 2.0 laboratory at IIPH Shillong

A CSCMI 2.0 Laboratory has been developed at the Indian Institute of Public Health, Shillong. The space provided for the laboratory has been renovated and also upgraded in terms of infrastructure to enable an effectual operation of various sensitive technologies. The primary role of the laboratory team is to ensure efficient possible detection of the malaria parasite i.e. *Plasmodium vivax* and *P. falciparum* from blood samples collected by the field team. Besides microscopic detection (being the gold standard) and rapid diagnostic test, molecular assay based detection employing species-specific multiplex Polymerase Chain Reaction (PCR) is employed for both sensitive detection and also validation of the positive immuno-chromatographic rapid test done at the field site(s). Long term storage, preservation and systematic maintenance of collected samples i.e., RBC, plasma and DNA is one of the many roles that the laboratory members perform in close coordination with the field team.

The following equipment are currently available at CSCMI lab at IIPH-Shillong:

1. Two T100™ Bio-Rad Thermal Cycler.
2. Olympus CX21I binocular microscope
3. -80°C freezer
4. -20°C freezer and refrigerator
5. Two sets of Electrophoresis system
6. Eppendorf refrigerated centrifuge-5702 R (for high volume sample, swinging bucket rotor)
7. Eppendorf refrigerated centrifuge-5424 (fixed angle rotor)
8. Vortex, rotatory plate shaker and dry-bath heat block.
9. Microwave oven and digital weighing balance.

9. SAG and other meetings

The CSCMI 2.0 activities are supervised by a team of international researchers appointed by the NIH, USA. On March 26, 2018 the team presented an update of the progress to the SAG members at the Washington University in Seattle.

In addition extensive discussions regarding a Supplement research application to be submitted in May 2018 was also presented to the SAG member by the CSCMI 2.0 team and collaborators.

Representatives of the CSCMI 2.0 team attended ICEMR workshop hosted by NIH and provide progress update on May 13-16 at Chiang Mai.

Recruitment and hiring of staff

Posts of field research and laboratory personnel advertised in Devnet and Shillong Times, local newspaper. Interviews for field and laboratory personnel conducted on May 2, 3 and 4, 2018. Dr S lyngdoh State Entomologist, was on the interview panel as the representative from the Govt. of Meghalaya.

The following full time staff have been hired and are currently working on different aspects of the study:

Project Coordinator/ Epidemiologist: Mr. Badondor Shylla

Epidemiology team:

Ms Phibansuk Lyngdoh,

Ms Christine Manar,

Mr Enrichson Suting,

Ms Charisma N. Khongwar,

Mr Peter.J.Marbaniang,

Ms Jurysha Dkhar,

Ms Manroi Challam and

Mr Watson Siangshai

Laboratory team:

Mr Bandapkupar Mawkhlieng,

Mr Zachariah B.L.Sun

Ms Innangkyntiew.L.Sangriang

Vector team:

Mr Alman Kshiar,

Mr Oling Lamin

Mr Fourness Lamin Amdep

In addition Ms Gitimoni and Mr Frankystar have been providing admin support on a part time basis.

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Sample images from field visits and consultations

