वार्षिक प्रतिवेदन

Annual Report

2017-18

आई.सी.एम.आर-क्षेत्रीय आयुर्विज्ञान अनुसंधान केन्द्र

ICMR - Regional Medical Research Centre

Dept. of Health Research, Ministry of Health & Family Welfare
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Contents

Contents

Annual Report Editorial Team:

- Dr. Sanghamitra Pati — Director
- Dr. A. K. Satapathy — Scientist-F
- Dr. D. Bhattacharya — Scientist-C
- Dr. Banamber Sahoo — Lib & Inf. officer

From the Director's Desk.....

Warm greetings from ICMR RMRC Bhubaneswar! It is truly a moment of great delight to witness yet another year of remarkable achievements as the institute marches ahead inits journey through 2017. Inundated with scientific research, human resource capacity building, health system strengthening, public outreach and advocacy activities and outputs, the annual report 2017-18 demonstrates the cumulative and collective contributions of all the members of RMRC Bhubaneswar Family towards addressing regional health priorities. My in-depth compliments to all my colleagues for their tireless efforts and zeal with a special note of accolades to the Editorial team for this extremely well compiled report.

Established in the year 1981, as a regional research institute under the aegis of Indian Council of Medical Research, our mission since inception has been to improve the key health indicators in the region through seamless integration of clinical, translational, basic and implementation research. We have been successfully able to produce remarkable change in reducing the burden imposed by communicable, non-communicable and nutritional diseases in the region. Though initially limited to few diseases and geographic location, currently we have expanded three dimensionally thus increasing the length, breadth and depth of our research domains.

The year 2017 has witnessed a substantial growth in our extramural Grants with 33 new scientific publications. The average impact factor of our publications reached a historic figure of 5.3 this year thus surpassing all previous records. At present, more than fifty researchprojects are ongoing that span major public health challenges namely Tuberculosis, Undernutrition, Viral Infections, Malaria and other vector borne diseases, Parasitic, Zoonotic and Diarrhoeal diseases, Haemoglobinopathies, Maternal and Child Health. I invite you to have a detailed browsing of our website too.

Equipped with state of the art laboratories, outpatient facility, two tribal field units and one model rural health research unit, the centre has been consistently contributing to evidence generation and translation in urban, rural and tribal health research. We are one of the six National Reference Laboratory (NRL) for Tuberculosis and one among the five regional virology research and diagnostic laboratories (VRDL) in the country. In recognition of our benchmark diagnostics, we have been designated as the apex lab for H1N1, Dengue, Chikungunya and Zika by the state Integrated Disease Surveillance Program (IDSP) and acknowledged as the research lead for Chronic Kidney Diseases in the region. RMRC Bhubaneswar is a partner of Measles, Rubella, Zika, JE and Viral Haemorrhagic Fever Surveillance Network along with routine surveillance for cholera and other diarrhoeal diseases. The NRL of RMRC caters to the TB referral diagnostics needs in ten states including 7 states of the North East thus actively supporting to the National TB elimination agenda and is on the verge of NABL accreditation. The TB-Nutrition Project, an implementation research project that examines the effect of nutrition supplementation on TB outcomes is a major milestone in the path to control TB and inform policy change.We have successfully completed the Targeted Intervention for Elimination of TB project in Jharkhand. Further, the centre is one of the study sites for the TB Vaccine Trial along with AIIMS Bhubaneswar. Our robust entomological surveillance and quality laboratory diagnosis has been able to help the state in successfully controlling the dengue upsurge this year with substantial reduction of morbidity and adverse outcomes.

In view of the continuing undernutrition burden, the centre has undertaken key task force projects on mapping the magnitude of nutritional deficiencies (Vitamin A, Fluorosis, Iodine Deficiency) in the state and is a part of the National Nutrition Surveillance system. The mid-day meal program evaluation study is supporting the implementation of the state's flagship program while the nutrition-agriculture linkage project envisages to give strategic inputs for nutrition responsive agricultural practices.

This year the centre initiated its research into zoonotic diseases by conducting the first ever epidemiological inquiry on anthrax and now developing a road map for the disease elimination from the state on a demonstration model which could be replicated in other region subsequently. Further the JE vaccine effectiveness study and setting up a laboratory diagnosis system of Scrub Typhus are two major initiatives that have strong potential to address the related morbidity in tribal population.

Another recognition came our way this year. The Centre became a Health Technology Resource hub (HTA) by the Department of Health Research with the objective ofpolicy. The permission to launch its Master of Public Health (MPH) has been obtained and we are all set to launch the program from the academic year 2018-19. This year, we have entered into mutually enriching collaborations with AIIMS Bhubaneswar, Institute of Life Sciences research institutions and hospitals to form regional networks of biomedical research expertise.

The Library & Information Centre continue its *Monday Morning* and *Daily article services* along with subscription of medical databases like EBSCO, ERMED, ProQuest and software like *iThenticate*, Endnote, MAXQDA, ATLASTI, STATA, and SPSA to strengthen both qualitative and quantitative research in the centre.

Our doctoral academic program continues to attract young talent; this year we have 11 Ph.D students undertaking research cutting across disease biology, newer diagnostics and innovative health technology. The Centre's campus is agog with academic fervour of the research scholars as well as scores of young masters' students who come to learn through laboratory attachment for their internship and summer training. Our staff are proactive in cultural and day observation events, especially round the year Swachh Bharat activities for the general public in a bid towards fulfilling its broader social responsibility.

I convey my congratulations to all those who brought accolades to the centre through obtaining competitive grants and participating in different national and international fora. I thank all scientists, researchers, and scholars, technical and administrative staff here at our centre and our project staff working in field for their remarkable contributions.My sincere gratitude to all our collaborating partners for their support in undertaking many transdisciplinary projects. The State Health and Family Welfare Departments of Odisha and Jharkhand, Central TB Division deserve special mention for their constant support and continuous cooperation. My special gratitude to the esteemed members of our Scientific Advisory Committee for providing insightful directions to our research. I extend thanks to the members of our ethical and other committees as well.

In particular, I would like to record my gratitude to Prof Balram Bhargava, our Secretary DHR and DG ICMR and Dr SoumyaSwaminthan, Former DG for their inspiring guidance towards prioritising our research responsive to the health needs of the country and engaging strongly with health system and policy. We are grateful to the ICMR headquarters and the Department of Health Research for their unconditional support and strategic leadership.

I also take this opportunity to bid adieu to four of our family members who superannuated this year. At the same time, my warm welcome to those who four joined the RMRC Bhubaneswar family in 2017. I wish all the team members of RMRC Bhubaneswar a productive upcoming year fostering new collaborations and galvanize disease relevant research.

As we move ahead in our sojourn to catalyse the research-practice- policy ecosystem in the region, I would like to conclude with an immensely inspiring quote of our Father of Nation Mahatma Gandhi "*Be the Change You Want to See in the World*". Let this guiding principle propel all our current and future research activities.

Dr. Sanghamitra Pati
MBBS, MD, MPH
Director

Ongoing Studies

Contents

1. Biomedical Informatics Centres of ICMR at RMRC, Bhubaneswar

Principal Investigator : Dr. N. Mahapatra, Scientist-F
Co-Investigator : Dr. B. Dwibedi, Scientist-E
Starting date : 01/04/2013
Duration : 5 years
Funding : ICMR, New Delhi

Objectives

- To identify genetic loci associated with diseases of National interest such as Diabetes, Cancer, Stress, Mental illnesses etc. in Indian population.
- To develop solutions for controlling pathogens causing diseases of National interest such as Tuberculosis, Malaria, and AIDS etc.
- To develop a National Repository of clinical information/data, high-throughput data, genotype and phenotype.
- To promote applications of cutting-edge technologies in medical research.

Background:

Biomedical Informatics Centres, RMRC, Bhubaneswar is one among the 19 centres sanctioned by the second phase Task Force Biomedical Centre's of ICMR on 01/04/2013 with a primary mission to promote, support and accelerate the research activities in the field of medical science research through informatics. Since its inception, the centre is actively involved/engaged in catering the needs of Bioinformatics in Biomedical research of RMRC, Bhubaneswar as well as other medical/research institutes of eastern region of Odisha. Apart from catering the need of Bioinformatics, the centre also supports the analysis of the in-house epidemiological, anthropological and NGS data generated in its centre. Keeping in view the objectives of the ICMR-task force in mind, the centre has undertaken several research works and conducted workshop-cum-training programs at RMRC, Bhubaneswar during session 2017-18, which are highlighted below.

Research Activities of Centre

To achieve the objectives of ICMR-task force, following projects were undertaken during 2017-18.

Project-1: Structural dynamics of Casein Kinase I (CKI) from malarial parasite *Plasmodium falciparum* (Isolate 3D7): Insights from theoretical modelling and molecular simulations.

Progress

Casein kinases (CKs) are vastly expanded in various organisms, where, the malarial parasite Plasmodium falciparum possesses a single member i.e., *Pf*CKI which can phosphorylate various proteins in parasite extracts in vitro. The study was undertaken to unravel the structure-function mechanism and mode of ATP recognition in PfCKI through a combinatorial approach involving theoretical modeling, docking, molecular dynamics (MD) simulations and MM/PBSA binding free energy estimation. The Bi-lobed catalytic domain of PfCKI shares a high degree of secondary structure topology with CKI domains of rice, human, and mouse indicating co-evolution of these kinases. Molecular docking study revealed that ATP binds to the active site where the glycine-rich ATP-binding motif with few conserved residues plays a crucial role maintaining stability of the complex. Principal component analysis (PCA) displayed that the overall global motion of ATP-bound form is comparatively higher than that of apo form.

Conclusion:

The important residues identified in this study i.e., Ser17, Gln48, Tyr51 and Phe150 aid in tight anchoring of the ligand within the bi-lobed cavity of PfCKI through strong H-bond, which is consistent

with the closest structural homologs. It is assumed that further studies involving site-directed mutagenesis and biochemical studies of this important enzyme would open up better avenues to understand the mode of catalysis and can answer important questions related to malarial parasite's protein phosphorylation mechanism in near future.

Project-2: **N**ovel Insights into the Molecular Interaction of a Panduratin A Derivative with the Non Structural Protein (NS3) of Dengue Serotypes: A Molecular Dynamics Study.

Progress

To the best of our knowledge, this is first ever study which provided atomistic insights into the interaction of PKP10 with NS3 protein of dengue serotypes.

Conclusion:

The result from our study along with *in vitro* studies is expected to open up better avenues to develop inhibitors for dengue virus in the near future.

Project-3: Insights into the mode of recognition of DIII of dengue E protein with GRP78: A molecular dynamics approach. *(It is in Process.)*

Project-4: Molecular dynamics insights into the structure, function, and substrate binding mechanism of mucin desulfating sulfatase of gut microbe *Bacteroides fragilis*.

Progress

The domain architecture and mode of substrate binding (ii) conformational dynamics and flexibility that influence the orientation of substrate, (iii) energetic contribution that plays very decisive role to the overall negative binding free energy and stabilities of the complexes (iv) critical residues of active site which influence binding and aid in substrate recognition.

Conclusion:

This is the first ever report, depicting the molecular basis of recognition of substrates and provides insights into the mode of catalysis by mucin desulfating sulfatase enzymes in gut microbiota. Overall, our study shed new insights into the unmapped molecular mechanisms underlying the recognition of various substrates by mucin desulfating sulfatase, which could be of great relevance in therapeutic implications in human gut microbiota associated disorders.

Project-5 Design, synthesis and computational analysis of isoniazid (INH) derivatives against *Mycobacterium tuberculosis* (Mtb). In this study molecular docking, molecular dynamics simulation, PCA analysis and binding energy estimation were performed by targeting wild and mutant type drug targets of Mtb (in collaboration with SOA, Bhubaneswar). The results from this study is expected to pave the way for discovery of anti-TB agents holding INH as a nucleus including INH hybrids and INH hydrazide-hydrazone derivatives. *(It is in Progress.)*

HRD activities by BIC :

I. M.Sc. students from IIT, Kharagpur, and BJB Autonomous College, Bhubaneswar carried out dissertation work and submitted their thesis.

II. Mr. Shasank Sekhar Swain, Ph. D scholar, of SOA University, Bhubaneswar is collaboratively doing his research work on development novel drugs for MDR TB.

III. Dr. Smaranika Pattnaik (a faculty member of Sambalpur University) is pursuing her research work in collaboration with Biomedical Informatics Centre for the partial fulfilment of degree in D.Sc.

IV. Dr. Ganji Purna Chandra Nagaraju, Faculty member at the Winship Cancer Institute, Emory

University, Atlanta, Georgia, USA has carried out his training in Bioinformatics at this Centre.

V. The centre also extends its expertise in the research activity of the research scholars and faculties/clinicians of this centre as well as from other institutions/universities.

Workshop-cum-training programme of BIC

Emphasizing the importance of data registry, the Centre has organized Two days workshop-cum-training on "**Developing and Operating Clinical Data Registries"** on 22nd – 23rd June, 2017. The workshop-cum- training was attended by 30 participants those were mostly medical faculties from AIIMS, SUM Hospital, SCB Medical College and MKCG.

2. Prevalence of asymptomatic malaria infection below 5 years and mode of transmission in Kandhamal district of Odisha.

Principal Investigator : Dr N.Mahapatra, Scientist-F
Coordinator : Dr S. Pati, Director
Co-Investigator : Dr R. K. Hazra, Scientist-E
Duration : 1 year

Objective:

- To determine the prevalence of asymptomatic *Plasmodium* infection below 5-year children in Kandhamal district of Odisha.
- To determine the per man hour density and transmission potential of vectors of the study area.

Background:

Malaria continues to be one of the most important public health problems in Odisha state. India is confronted perennially, and there are no signs of it abating. With only 4% of the country's population, Odisha state contributed 43.9% of *Plasmodium falciparum* malaria and 25.5 % of malaria deaths reported in the country during 2008. Malaria is highly complex in Odisha because of the state's vast tracts of forest with tribal settlements. The dynamics of malaria vary from place to place. The disease is geographically distributed but remains entrenched in poor population groups particularly in hilly and forested areas characterized by high incidence and deaths due to P. falciparum infection. Of the 30 districts of Odisha state, Kandhmal district is one such area with many hills and forests, having API ranging from 2 to 237, *Pf* % more than 85-100%, TPR from 1.5 to 50%. Death due to malaria in Odisha have declined from 2001 to 2007, but have increased from eight in 2001 to 29 in 2007 in Kandhamal, that contributed 13.55 percent of total malaria deaths in Odisha. Despite of well planned malaria control programme implemented by NVBDCP malaria has clearly emerged as one of the most prevalent diseases in the district that poses a serious health hazard and is a matter of concern. Since asymptomatic infection by *Plasmodium* parasite pose a real public health challenge in elimination of malaria, hidden parasite burden needs to be addressed properly for reducing the parasite reservoir. A large reduction in this pool will lower the chance of disease transmission and help in achieving its elimination. Therefore on request of NVBDCP, Govt. Of Odisha we propose the present study with the aim to estimate asymptomatic parasite carriers among under 5 children of Kandhamal district and help programme to develop strategic plan for addressing this issue.

Materials and Methods:

Study Area: Study was conducted in Kandhamal district of Odisha. The district is situated within the longitudes 830 30′ and 840 35′ East and latitudes 190 34′ to 200 30′ North, having a population of 7, 33,110 (Census 2011).

Study Population:

Case definition: Children under five without having measurable raised body temperature (Auxiliary temperature< 37.5^{0}C), who report no

malaria related symptoms and have not received treatment for malaria in last seven days, but found positive for plasmodium infection by any one of the test method i.e., RDT, Microscopy or by PCR was considered as a case of asymptomatic carrier.

Selection procedure:

The study team visited households, door-to-door to enumerate the study group. The information on gender, age, height and weight, current history of fever or previous H/o similar episodes, date of last malaria diagnosis, result and treatment received were collected on a pre-structured format. All available under five children were clinically examined and selected as study subject based on the inclusion and exclusion criteria.

Blood sample (100 microliters) by finger prick was collected for the laboratory diagnosis of malaria parasites. Rapid diagnostic testing (RDT) was performed at the spot and the microscopy was done at RMRC laboratory for which the samples was collected, dehaemoglobinised and dried properly and was transported from the field after every visit. All positive individuals were treated with an artemisinin based combination therapy (ACT) as per the National Vector Borne Disease Control Programme (NVBDCP) guidelines.

Laboratory Investigation:

- Microscopy: Both thick and thin blood films was prepared from capillary blood collected by finger prick, stained with JSB stain and examined by two microscopists for detection of malaria parasite and parasite species.
- RDT-based diagnosis: RDT was performed with a kit (supplied by NVBDCP) containing a monoclonal anti- P. falciparum histidine - rich protein II (HRP-II)- specific antibody and an anti-Plasmodium vivax p-LDH-specific antibody (as used by the programme) to detect any malaria parasite infection.
- PCR: Nested PCR was done as additional tool to identify the asymptomatic cases.
- Haemoglobin Estimation: The blood sample was collected in filter paper and transported to RMRC for Haemoglobin estimation by Cyanomethoglobin method.

Results

The following blocks of Kandhamal districts namely Phiringia, Khajuripada, Kajamandi Nuagaon, Tumudi Bandha and Daringibadi were selected as study block based upon the API. A total of 130 slides were collected from under five children and RDT was done for all. Only one case was positive for RDT and blood slide examination in Phiringia Block. Similarly 168 samples were collected from Khajuripada block and none found positive. While 86 samples collected from Tumudibandha showed five samples to be positive for both RDT and blood slide examination.

Entomological Survey

Entomological survey was also conducted in the study blocks. Three known vectors i.e., *An.fluviatilis*, *An. culicifacies* and *An.annularis* were collected and kept in the RMRC laboratory for detection of sporozoite. *The study is in progress.*

3. Mapping of hotspots and assessment of malaria parasites in coastal regions of Odisha

Principal Investigator	:	Dr. M.R. Ranjit, Scientist-F
Co-Investigator(s)	:	Dr. R K Hazra, Scientist-E Dr. M S Bal, Scientist-C Dr. H K Khuntia, STO (II)
Collborator (s)	:	Dept of Health Services, Govt of Odisha
Duration	:	2 Years
Funding	:	ICMR-Intramural

Objectives

(a) To assess the presence of "hotspots" and develop a map based on pre-existing malaria infection rate and physical geography data

(b) To analyse the genotypes of *P vivax* to know the rate of relapse / re-infection

(c) To investigate the response of *P vivax* to CQ and Primaquine used in the programme

(d) To explore the level of asymptomatic carriers in low endemic population

(e) To assess the impact of imported malaria on local transmission of parasites.

Background

Odisha is known to be endemic region for malaria in the country. Large scale interventions have cut down the incidences of malaria to <1 API in at least 8 coastal districts (Balasore, Bhadrakh, Cuttack, Jajpur, Jagatsinghpur, Kendrapada, Khurda and Puri) of the state. The state envisages strategic intervention for achieving zero indigenous transmission at sub state level and targets to eliminate malaria from the state by 2030. The key activities identified are intensive surveillance, identification and clearing of residual foci by complete radical treatment and focal vector control measure along with constant vigilance for maintaining malaria free status. Such activities need supplementation of data on the micro epidemiology of *P vivax*, the dominant parasite of the region. The results will help the policy makers to adopt suitable intervention strategy to eliminate the disease.

Progress

During the period under report the sub centre wise malaria data of 9 coastal districts have been collected from the NVBDCP-Odisha project office, under Dept of Health & Family Welfare, Government of Odisha for last 3 years (2015, 2016 and 2017). Since the data available for 2017 was incomplete (up to the month of August), we have taken the 2016 data as the reference for further analysis. When compared the data for the three years no remarkable difference was observed. Assessment of the sub center wise Annual malaria incidence (2016), showed that out of total 2368 sub centers in 9 districts (Balasore, Bhadrak, Cuttack, Jajpur, Ganjam, Jagatsinghpur, Puri, Kendrapada and Khurdha), 915 sub centers reported malaria. Out of

Table 1: Sub center level malaria data in 9 coastal districts of Odisha during 2016.
(Source: Dept of Health & Family Welfare, Government of Odisha)

Sl. No.	Name of the District	Total Sub centers	No of Sub centers reporting malaria	No of Sub centers reporting API >1	No of Sub centers reporting API >5	No of Sub centers reporting API >10
1.	Balasore	275	139	21	2	4
2.	Bhadrak	178	86	5	0	0
3.	Cuttack	332	97	35	4	4
4.	Jajpur	260	56	12	0	0
5.	Ganjam	460	385	118	70	26
6.	Jagatsinghpur	189	18	4	0	0
7.	Puri	241	41	2	0	0
8.	Kendrapada	227	26	8	1	0
9.	Khurdha	206	67	7	1	2
	Total	**2368**	**915**	**212**	**74**	**36**

these, 74 sub centers have API>5 and 36 sub centers have API>10 (Table 1).

The ABER ranges from 9.74-42.72. The Pv % ranges from 24.8-100%. The *vivax* malaria problem in Asia-Pacific is complex and presents a variety of challenges to control. As in the other parts of Asia, where drug resistance is emerging and malaria cases of equivalent clinical severity to *P. falciparum* have been observed in Odisha too (data not presented). The highest peak of this seasonal disease was observed during July–August, showing around 38% increase in the incidence as compared to the annual mean. The minimum malaria incidence was observed during January, which was 27% less than the mean annual incidence.

Future plan of work:

The work is on progress in the selected study sites *P vivax* will be isolated and genotyped with particular reference to the drug resistance and transmission pattern will be analyzed and a cross section survey will be done to find out the prevalence of asymptomatic malaria cases.

4. The impact of intestinal helminths on the immune responses by routine immunization.

Principal Investigator	:	Dr A.K.Satapathy, Scientit-F
Co Investigators	:	Dr M S Bal, Dr. MR Ranjit & Dr B Dwibedi
Coordinator	:	Dr S. Pati, Director, RMRC
Starting date	:	January 2018
Duration	:	2 years
Funding	:	ICMR-Intramural

Objectives

- To evaluate the sero-prevalence of measles, BCG and DPT in immunized children infested with intestinal helminthes
- To assess the role of Int helminthes on immune response in immunized children

Back ground:

Vaccines are among the most cost-effective health interventions available for the prevention of life-threatening and disabling infectious diseases. The overall effectiveness of vaccine requires induction of a satisfactory protective immune response in each susceptible individual. However, the response to standard vaccination often remains suboptimal in developing nations. Several vaccination studies have shown that children from areas of sub-Saharan Africa are less responsive to standard childhood vaccines than children from developed countries. Emerging clinical evidence suggests that chronic antenatal parasitic infection can significantly alter infant immune responses to standard childhood vaccinations. These include vaccine trials of the anti tuberculosis vaccine (BCG), measles, typhoid fever and polio vaccines. Humans harbouring helminths can influence vaccine effectiveness by modulating host immune responses particularly when Th1 dependent cellular responses are required. Helminth infections induce immuno regulation by various other mechanisms, increased interleukin-10 production and affect responses to non-helminth antigens. Thus helminth infections could inhibit protective Th1 responses to unrelated organisms, such as viruses, bacteria, and vaccines, by inducing a Th1 to Th2 switch. The underlying mechanisms behind down regulation of cellular proliferative responses remain unknown. The reasons for this poor vaccination response are not known. Clinical evidence suggests that chronic antenatal parasitic infection can significantly alter infant immune response to childhood vaccination. Helminthic infection in human can influence vaccine effectiveness by modulating host immune response. Several reports suggest that helminthic infection induced impaired cellular and humoral responses to non parasite vaccine antigens.

However, there has been no work done examining response to bystander suppression associated with helminthic infection. The aims of this study are to investigate the hypothesis that whether int. helminthic infections influence the generation of the immune response to standard childhood vaccination.

Progress:

The protocol has been as finalized as per suggestions. This project has been reviewed and approved by Institutional ethical committee. The chemicals and reagents required for this study are under process for procurement. Efforts are being made to collect stool as well as blood samples from helminthic endemic area. Background works such selection of rural village for collection of stool and blood samples is being initiated. The parents of the children will be counseled and motivated to take part in the study. Stool samples will be used for diagnosis of intestinal and systemic helminth infections and blood samples will be used for the quantification of measles, BCG and DPT antibody. The plasma samples will be also used for cytokine assay. Quantification of measles, BCG and DPT antibodies in samples is being standardized in our laboratory.

5. Environmental reservoirs of *V.cholerae* sero groups in the tribal areas of Odisha

Principal Investigator : Dr. B. B.Pal, Scientist - F
Co-Investigator : Dr. Basant Kumar Das, Director, ICAR- CIFRI, Kolkata
Starting Date : 15.03.2017
Duration : 3 years
Funding : ICMR

Objectives:

- Isolation and identification of zooplanktons, phytoplanktons from environmental water sources of Rayagada district.
- Isolation and identification of *V. cholerae* O1/ O139 and non O1 /non O139 from different water samples and rectal swabs, collected from diarrhoea patients.
- Detection of various *tox*ic genes like *rfb* O1, O139, *tcpA, ctx A* and *omp W* gene and the clonality of *V.cholerae* strains will be done between the clinical and environmental isolates of *V.cholerae* to find out the source of infection.

Background:

Over past two decades we have studied many cholera outbreak and epidemics in coastal and tribal areas of Odisha where *V.cholerae* O1 and O139 serogroups, biotype El Tor and El Tor variant were reported. The altered *V.cholerae* O1 with the *ctx*B gene of classical strains caused first outbreak in the tribal areas of Odisha during 2007and subsequently during 2009 in coastal areas, 2010 in Rayagada district, 2011-2012 in Kalahandi, Koraput, Rayagada and Gajapati district were reported. The large cholera outbreak in the Narla block of Kalahandi district during 2014 was due to *ctx*B7 of hitian variant of *V.cholerae* O1 was reported and published. From our recent studies in the tribal area funded by Tribal task force, ICMR (October 2010 to September 2013), it was observed that cholera was seasonal in the tribal areas. During the outbreaks and epidemic periods we were able to isolate *V.cholerae* from river, stream, nala, chua from the tribal area during 2007, 2010, 2012, and 2014. But the inter epidemic status of *V.cholerae* strains in the aquatic environment in the tribal area is not known. So the present study has been envisaged to study the aquatic environment like water, zooplanktons, phytoplanktons, crab isolated from different water bodies and the existence of *V.cholerae* sero groups in that environment. Simultaneously, the diarrhoea patients will be monitored for the isolation of *V.cholerae*.

Progress:

During the period, June 2017 to December 2017, the above project was carried out in kashipur and K.singhpur blocks of Rayagada district. Rectal swabs from diarrhoea patients attend hospitals and from villages, water and plankton samples were collected from environmental sources. Both stool, water and plankton samples were processed as per our earlier practice in the lab.

339 rectal swabs were processed out of which 299 (88.2%) were culture positive and 40 (11.8%) were culture negative. Among the culture-positive samples *E.coli* were 256 (75.5%), *Shigella* spp 21 (6.2%), *Salmonella* 4 (1.2%), *Aeromonas* 18 (5.3%) and no *V.cholerae* was isolated. More number of diarrhoea cases were reported during July to October, 2017. Among the *Shigella* spp isolated, *S.dysenterae* type-1 were 2, *S.flexnerae* 14, *S.boydii* – 5.

Similarly, 622 water samples analyzed, out of which 11 (1.76%) were *V.cholerae* non O1 non O139, 6 (0.96%) were *V.cholerae* O139. All the *V.cholerae* O139 were isolated during the month of August from K.singhpur after the flood of July 2017. Again 326 plankton samples were processed out of which 14 (4.3%) were *V.cholerae* non O1 non O139 and only one *V.cholerae* O139 was isolated. All the stool and water sample reports were regularly submitted to CDMO, Rayagada and Director of DPH, Govt. of Odisha. As a result of which adequate control measures were implemented in proper place and time. **The people were made aware not to use the water positive for *V.cholerae* O139 for drinking and cooking purposes. So the transmission of cholera from water to human being was checked which is a breakthrough of our findings.**

The identification of the planktons was done. The phytoplanktons were dominated over zooplankton and those were Navicula, Nitzschia, Fragilaria, Cymbella, Synedra. There are several reports published regarding the association of Planktons with *V.cholerae* from Bangladesh and Maryland.

The molecular analysis of all the water isolates of *V.cholerae* O139 and non O1 non O139 reported that the *V.cholerae* O139 were positive for *tox*R gene including non O1 non O139.

Outbreak of cholera in Belabahali village, Keonjhar District

As per the available information from ADMO (PH), Keonjhar district and from media it was hoped that there was a diarrhoeal outbreak in Belabahali village of Andapur block on 2.5.2017. I discussed with our Director regarding its investigation. Then myself along with S. K. Mallik (lab. attendant) proceeded to Belabahali village of Andapur Block on 2.5.2017 early morning for situation analysis, sample collection, to find out the probable source of infection and spread of diarrhoeal outbreak. After reaching the affected villages a discussion was carried out with ADMO (PH), Medical officer, (Anandapur SDH), paramedical staff and among the villagers regarding the incidence of diarrhoea cases, index case, location of village, drinking water sources, hygienic condition of the area etc.

About the village

The Belabahali village is located near the highway from Panikoeli- Jajpur- Anadapur- keonjhar road at the bank of Kusei river. There is a side road from the NH leading to Belabhali village, crossing the river. The total household is 892, population-6700. Ninety eight percent of the people are OBC and 2% belong to SC and general caste. The literary rate is about 50% and people are mostly businessman. The village is having 5 Sahi called as Upper sahi, Bermunda sahi, Kimbhira sahi, Tala sahi and Tikar sahi and all were affected due to cholera. There were few bore wells which water were rarely used by the people for cooking and drinking purposes. Due to their misbelieves that they cannot prepare rice water and these were not suitable for cooking. Few ponds were

located which were used for bathing and cooking purposes. The people mainly depend on the supply water from the river which supplies water twice a day during morning and afternoon. The pipe has been embedded in the river bed and the filter is less than four feet below from the surface of river bed. There is a well near the bank of the river and the submersible pump is inserted into the well. This well is connected to a overhead tank from which the water is being supplied to the village. But during summer the river bed was dried up and artificial sand bandha of low height was made to store the flowing water. During this season the temperature is very high and there was intermittent rain fall. Due to scarcity of water the water was directly supplied to the village from the river bypassing the over head tank. As per the discussion among the villagers it was found that muddy- red colour water was supplied through the pipe during last week of April and there was leakage in the filter of the submerged pipe on the river bed. Secondly there was no chlorination done to the supplied water. This is the best evidence that the contaminated muddy water was directly supplied to the villagers which was the major source of infection.

Household Survey

After reaching the spot there was discussion among the villagers to find out the index case, total cases affected, source of infection, mode of transmission etc. The rectal swabs were collected from the diarrhoea patients from the village and also from the hospitalized patients from Anandapur SDH hospital. Similarly water samples were collected from direct supply water from different points from 5 sahi, like source point, different ponds, household water used for cooking, cleaning utensil and drinking purposes for laboratory examination.

Index case

It was found that a 75 years old female from the village suffered from profuse rice water stool, vomiting, pain in abdomen on 30th April 2017 at 11pm having abdominal cramping and muscular pain. She was admitted to the hospital on 1st may 2017 at 9am early morning. She collected muddy water in day time on 30th April and that water was used for cooking and preparing rice water and used for drinking also. She did not attend any relative's house and no relatives visited her house on the previous day who were suffering for diarrhoea. On 1.5.17 in the afternoon there was torrential rain fall starting from 2pm to 5pm in that village. Suddenly more number of cases were reported. There were 21 cases reported from 30.4.2017 to 2.5.17 5PM.

Bacteriological Analysis:

Rectal swabs:

Total swabs collected	:	20
V. cholerae O139	:	15
Salmonella spp	:	1
Shigella spp.	:	1
E. coli	:	3

Water Samples:

One (Supply starting point) out of 11 water samples was positive for *V. cholerae* O139 sero group.

Antibiogram Profile:

Sensitive: azithromycin, chloramphenicol, cotrimoxazole, ciprofloxacin, ofloxacin, doxycycline, norfloxacin, tetracycline, trimethoprim and gentamicin

Resistance: ampicilin and streptomycin

The interesting finding of this study was that all the clinical and water isolates of *V.cholerae* O139 were

showed a mixture of classical and El Tor *ctx*B. The sequencing results of clinical and environmental strains exhibit a single mutation at amino acid position 132; the cysteine has been substituted by glutamine. Three interesting findings emerged from this investigation and they were 1) the reemergence of *V. cholerae* O139 in Odisha after a hiatus of 10 years; 2) the reemerged O139 strains carried a novel *ctxB* genotype and this is the first report of such strains of O139 causing outbreaks of cholera and 3) a new variant of *V. cholerae* O139 has again emerged from the Bay of Bengal region.

6. Assessment of iodine status among pregnant women in Gajapati district of Odisha.

Principal Investigator : Dr. G. Bulliyya, Scientist-E
Co-Investigators : Dr. S. Pati, Director
Mr. R. K. Das, STO-II
Starting date : June 2017
Duration : : 2 years 6 months
Funding : ICMR

Objectives :

- To carry out longitudinal study to assess the serum/plasma micronutrient level, thyroid profile and urinary iodine level of pregnant women during first, second and third trimester as well as at the time of delivery, at 6 months and at one year after delivery and also to assess the newborns for birth weight and growth up to one year of age; and
- To estimate the iodine content in edible salt samples collected from household of study volunteers

Background

Iodine Deficiency Disorders (IDD) is one of the most challenging nutritional issues in India and pregnant women and their neonates are the most vulnerable target groups. The period of pregnancy is associated with parallel increase in iodine and thyroid hormone requirements indicating the need for additional iodine intake to prevent potential iodine insufficiency. During pregnancy, the requirement of iodine increases (250 ìg/day) when compared to normal adult (150 ìg/day) to meet the higher metabolic demands of thyroxin (T_4) production, transfer iodine to fetus and increased renal iodine clearance by the mother. Adequate iodine concentration in breast milk is essential for optimal neonatal thyroid hormone synthesis and neurological development in breastfed infants. Iodine deficiency increases the risk of still birth, abortions, increased perinatal deaths, infant mortality, and congenital anomalies. Children born to iodine deficient mothers often result in low birth weight, stunted growth, cretinism, and have lower intelligent quotient scores. Median urinary iodine excretion (UIE) is a key indicator of recent iodine intake among the population. Limited studies have been conducted to assess the status of iodine in pregnant and lactating women in India but national level data is not available for the same. The present study has been planned to assess the iodine status of pregnant women by estimating their urinary iodine concentration, the level of iodine consumption through edible salt and diet. Similar information will be collected from pregnant women post delivery i.e. when they are lactating (up to 1 year).

Methodology: A multi-centric longitudinal study is designed to recruit pregnant women in the first trimester and will be followed up during second and third trimester. Birth outcome will be recorded and women and child will be followed at six months and one year after delivery. The study covers 200 pregnant women in the first trimester based on sample size calculation (z=1.96; 2-t, mailed 0.05 hypothesis test, z(1-Beta) = 0.842; power= 0.8, effect size= 0.5, n=6 time points (first, second, third trimester and 3 observations in lactating period at birth of child, 6 months and at one year), Rho= 0.5 (correlation of

repeated measures) with a design effect 2 and expecting 20% droppers in the study.

The study area is Gajapati, a tribal-dominant district, covering 100 villages in two blocks (Mohana and Gumma) to enroll 200 pregnant women in first trimester. Household having pregnant women is included to collect socio-economic and demographic profile such as age, caste, dietary habits, educational qualification, family income, etc. using a pretested questionnaire at recruitment. A one-day 24-hour recall method of diet survey was carried out including food diversity using food frequency questionnaire. Information from pregnant women collected on last menstrual date, antenatal check up, number of birth using a pretested questionnaire. Blood pressure measured with an interval of 5 min by using Omran digital devise. Body weight, height and mid-upper arm circumference is measured at each visit. Household salt samples tested for iodine by titration method. Urine (10 ml) collected in sterile containers analysed for urinary iodine using Sandell and Kolthoff method. Blood samples (10 ml) collected and serum samples transported under cold chain to Coordinating Centre, CNRT, New Delhi for testing thyroid profile, thyroid stimulating hormone and other micronutrients. Ethical clearance obtained from Institute Ethical Committee and State Research and ethics Committee. Written consent in the local language is taken from all subjects after explaining them the purpose of the study.

Progress

Community-based survey is being conducted to enroll households having pregnant women in 1st trimester in Mohana and Gumma blocks of Gajapati districts. Information on socio-demographic and economic status on 110 households revealed that majority of households are scheduled tribes followed by OBC and SC by community. Tube well is main source of drinking water, while toilet facility is available in one-fifth of households. Mean household monthly consumption of salt is 1.68 kg and half of them consuming iodized salt in form of powder packets (Table-1).

Table-1: Household characteristics of pregnant women in 1st trimester in Mohana block in Gajapati district.

Parameter	N	Percent
Community		
SC	18	16.4
ST	55	50.0
OBC	26	26.4
Others	16	14.5
Religion		
Hindu	38	34.5
Christian	72	65.5
No Electricity	13	11.8
Toilet facility	21	19.1
Iodized salt	59	53.6
Both (iodized/nonIS)	3	2.7

Table-2 shows demographic characteristics of 110 pregnant women enrolled in the study and 14% of them are adolescent group. Majority of pregnancies are planned, and quite a few of them had miscarriages (10%) and stillbirths (2.7%). During 1st trimester, 52% of pregnant women had ANC visits by ANM (49%) or to doctor (4%) and received TT (32%) and IFA tablets (15.5%).

Knowledge, attitude and practices of pregnant women assessed for coverage and compliance salt iodization. Iodized salt is reported to be used by majority (72%) and 28% are using local crystal salt that is not iodized. Only 8% of pregnant women are aware about iodized salt and identify iodated salt logo (smiling sun) or written content on packet. Cost and local availability is said to be the considerable barriers in buying iodized salt. Container with a lid is said to

Table 2 : Individual characteristics of pregnant women in first trimester in Gajapati district.

Characteristics (n=110)	Detail	N	Percent
Age group (years)	<19y	9	8.8
	19-25y	61	55.4
	>25y	40	34.8
Planned pregnancy	Yes	97	88.2
Gravidity	<2	74	67.3
	>3	36	32.7
Miscarriages		12	10.9
Still births		3	2.7
Child deaths	Neonatal	2	1.8
	Under-5	2	1.8
ANC received		57	51.8
Received TT injection		36	32.7
Received IFA tablets		17	15.5
Consuming IFA		16	14.5

be the common practice for storage of salt in household. About knowledge, quite a few pregnant women heard on iodine deficiency and many not aware of its causes. Among those aware of the cases of iodine deficiency, very few women attributed to inadequate intake of iodine and its negative impacts on birth outcomes and infant growth (Table-3). Testing of household salt samples reveals that half of pregnant women are using salt having inadequate iodine of <15 ppm.

The mean anthropometric values and nutritional profile of pregnant women is shown in Table-4. Mean values of body weight, height, BMI, MAUC and haemoglobin are found to be lower in younger age of pregnant women as compared to their counterpart age group above 21 years.

Anaemia is defined when haemoglobin levels are lower than 11g/dL of blood. A level of 10-10.9g/dL is mild, 7-9.9 is moderate and less than 7g/dl is severe anaemia. The prevalence of anaemia is 85% among pregnant women in first trimester, 52 of them had moderate and 33% mild and 1% had severe categories of anaemia (Figure-1). More than one third (35.5%) of pregnant women had low BMI <18.5 kg/m2. Low vitamin B12 is defined as d" 203 pg/ml, and borderline-low levels were defined as 204-298 pg/ml. Of 110 pregnant women in 1st trimester, considerable proportion of them had vitamin B12 deficiency (<203 pg/ml).

Future plan

The study is longitudinal and will continue to

Table 3 : KAP of pregnant women on iodine deficiency disorders and iodized salt

Household salt	Particulars	n	Percent
Kind of salt used in house	Iodized	79	71.8
	Not Iodized	29	28.2
	Don't know	2	1.8
Identification of Iodized Salt	yes	9	8.2
Mode of identification of IS	Smiling sun	3	2.7
	Written on pack	6	5.4
Barrier in buying Iodized salt	yes	14	12.7
Kind of Barrier in buying iodized salt	Cost	11	10.0
	Availability	1	0.9
Storage of Salt	Container with lid	91	82.7
	Container with no lid	15	13.6
Heard about iodine deficiency	yes	12	10.8
Causes of Iodine deficiency	yes	9	8.2
Inadequate iodine intake	Yes	9	9.2
Negative impacts of iodine def.	Birth outcome/ infant growth	8	7.3

enroll pregnant women in remaining block of Gumma in Gajapati district and follow them up during second and third trimester. Birth outcome will be recorded and women and child will be followed at six months and one year after delivery. Data will be collected at each visit including collection of samples and

Table 4 : Mean (+SD) anthropometric and hemoglobin levels.

Characteristic	Total	17-21 years	>21 years	t-value(p-value)
N	110	36	74	-
Body weight (kg)	43.8+7.51	41.8+6.80	44.8+7.69	3.93 (0.004)
Height (cm)	149.3+6.61	147.8+6.59	149.9+6.54	2.58 (0.111)
BMI (kg/m2)	19.7+3.56	19.2+3.65	19.9+3.52	0.98 (0.350)
MUAC cm	24.5+2.44	24.1+2.20	24.6+2.54	1.35 (0.247)
Systolic BP mmHg	112.8+7.12	112.6+8.70	112.9+11.60	0.81 (0.893)
Diastolic BP mmHg	75.1+7.96	75.3+7.12	75.0+8.38	0.31 (0.861)
Pulse rate (min)	87.8+11.15	89.6+12.02	86.9+10.68	1.41 (0.236)
Haemoglobin (g/dl)	9.86+1.39	9.62+1.78	9.96+1.16	1.47 (0.227)

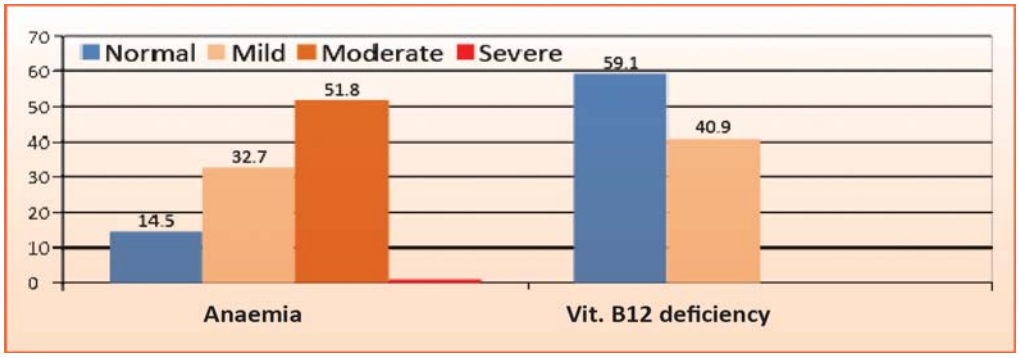


Fig.-1: Prevalence of anaemia and vitamin B12 deficiency among pregnant women in Mohana block, Gajapati district

laboratory investigations during 2nd and 3rd trimesters, at birth and subsequent follow up lactating mothers and their infants at six month and one year.

7. Study on concurrent monitoring and impact evaluation of mid-day meal programme implementation in Odisha

Principal Investigator : Dr.G.Bulliyya, Scientist-E
Co-Investigators : Dr. S. Pati, Director
Mr. R.K. Das
Starting date : November 2017
Duration : 3 years
Funding : ICMR

Objectives

The main objective is to evaluate the concurrent monitoring and implementation of the MDM scheme and its impact on nutritional and socio-academic improvements in school going children in Odisha.

Specific objects :

- To assess the nutritional status (wasting and stunting) of school children;
- To assess the micronutrients status (anaemia and iodine);
- To determine the wholesome food having requisite calorie and protein content in MDM;
- To study the enrollment, retention and drop-out of students vis-a-vis MDM coverage;
- To assess the coverage and compliance of school health program;
- To evaluate the water, sanitation and hygiene (WASH) practices in schools
- To assess the availability and adequacy of infrastructural facilities;
- To assess the MDM management and monitoring at each level;
- To assess the level of knowledge and awareness of stakeholders;
- To evaluate logistic supplies and management of MDM;
- To assess food safety measures in MDM;
- To assess the improvement in social and gender equity;
- To assess the community participation in MDM program; and
- To assess the nutritional support to school children in drought affected areas.

Background

The National Programme of Nutritional Support to Primary Education, popularly known as Mid-Day Meal (MDM) was launched in 1995 as a Centrally

Sponsored flagship school feeding scheme with a view to enhance enrolment, retention, attendance and simultaneously improving nutritional levels among children. Hot cooked MDM was introduced (2002) in all government and government assisted primary schools for at least 200 days in a year. Over the years, the scheme has been modified on different fronts such as age-groups, quantity of food items, nutrients support, cooking cost and honorarium for cooks. The scheme was renamed as National Programme of MDM in Schools (2008) that extended to cover children in upper primary classes for encouraging poor children belonging to disadvantaged sections. According to MDM Rules, 2015 under National Food Security Act (2013), the nutritional content of food has become an integral part of the right to food. The Scheme is the world's largest school feeding programme in 11.4 lakh schools to drive out class room hunger of 10.2 crore children who are the future of India.

MDM scheme in Odisha is implemented by the Department of School & Mass Education and State Project Management Unit which is the nodal agency for effective implementation and monitoring. Currently, Odisha has got 62,708 school kitchens catering over 51 lakh children getting hot cooked meal on every school day adherence to weekly menu. The level of malnutrition is of public health concern with over one third of school-age children (6-18y) being classified as undernourished and 75% are anemic. While primary objective of MDM is to improve nutritional status of school children, the impact parameters for assessment (height/weight) prescribed a decade later to monitor the incremental improvement in health levels as a benchmark. Given the spread of MDM at scale and magnitude, quality monitoring by stakeholders is a challenge at each level of implementation and corrective measures. The study is proposed in line to evaluate concurrent monitoring of MDM implementation, and impact evaluation in Odisha.

Methodology

Present evaluation study on MDM programme is being carried out to assess quality of programme implementation in the state. The study adopts multistage stratified cluster sampling frame to select each sample frame of districts, revenue blocks, clusters, villages and schools using mixed methods. The study covers all the 30 districts covering 10 districts each in north, south and central revenue divisions. Yearly, 5 districts will be covered for study in each division alternatively on the basis of their ranks using te.

In each district, 3 blocks selected on the basis of settings urban, rural and tribal or lowest literacy, thus total 45 blocks are selected from 15 districts yearly. Similarly, 3 clusters in each block on the basis of literacy rate (highest, median and lowest) and 3 village/wards/MDM schools selected o the basis of highest enrolment rate. Primary data is collected using some tools, case study, interview, focused group interview, observation (participant and non-participant) and some PRA techniques.

Study tools have been developed independently for implementation of quality MDM services in schools, nutritional anthropometry, students interaction, Focus group discussion on school management committees (SMC) and parents using pre-designed questionnaire. The questionnaires were examined for simplicity, uncertainty, time taken to fill it out and analyzability. The database was created by using software "EPI-INFO (version-7) using Android tablet. Three independent study teams conducting MDM school surveys, each having two field investigators and one laboratory technician and data is shared online to the server daily. The quality of data collected by the team members was ensured through

direct supervision by Research Assistant and Data Manager and subsequently by PI. A sample (10%) of collected data was cross-checked daily by P.I. Quality control procedures for this research was done by using Epi-info software.

One of the FI collects data on MDM implementation through direct interview from school MDM-In charge and CCH. Other FI enlist class-wise 10 students (5 boys and 5 girls) based on the attendance of that day for anthropometric measurement. The LT is responsible for the testing of salt for iodine, portability of water and testing of eggs and collection blood from 25% of samples for Hb. Later study team conducted FGDs of students, SMC members within school premises and parents at community level.

Progress

The study is carried out in Bhubaneswar, Jatani and Balipatna blocks in Khurda district. The primary motive behind running MDM scheme is to improve the status of primary education by enhancement of enrolment and attendance. The study reveals that out of 86 schools, 69 are in rural and 17 are in urban area of which 19.8%, 15.1% and 65.1% are Primary, Upper Primary and Nodal category of schools covering under Govt (86%) and Govt-aided (14%) schools.

Of total 86, only 12.2% of schools having 90% attendance on the day of survey and 71.4% of schools are covered 100% Aadhar enrolment. Majority of school MDM In-charges have the knowledge on all objectives (87.2%), however all in-charge knew about MDM weekly menu, prescribed quantity of food grains for both primary and upper primary students. Only 15% knows about the prescribed quantity of nutrients for primary and upper primary students.

LPG is the main source of cooking fuel (79.1%) in school kitchen and 20.9% schools were running through central kitchen using solar system for MDM preparation. Three-fourth of (76.7%) schools having separate kitchen-cum store and 79.1% schools have dunnage facility for food grains storage. The study reveals that 79.1%, 79.1%, 73.9% and 96.5% of schools are maintaining up to date stock & consumption, daily expenditure, SMC resolution and food tasting registers respectively. In 88.4% of school, health programme is covered half-yearly and 94.2% of schools having IFA tablets stock, while 87.2% and 100% schools implemented IFA supplementation and Bi-annual deworming including universal coverage of Japanese Encephalitis vaccination. Salt used for MDM in schools is adequately iodized in 90%, Dip testing of egg used for MDM in 28 schools found to be good quality. Testing of water samples for coliform in 47 schools confirmed 100% portable drinking water.

Monitoring and supervision of School Management Committee is regular on roaster basis in every school who are making resolutions as per programme guidelines. Other stakeholders at cluster (CRCC) visits to schools every month according to guideline and 52.3%, 19.8% and 10.5% school visits made by BEO/ABEO, DEO/ADEO/DPC and state representative respectively.

In this study sample 94.2%, 90.7%, 100% of school teachers expressed their opinion that MDM promotes school enrolment, attendance, sharing of meal, hygienic practice and not purchasing food from hawkers respectively and 68.6% of them given negative response as teacher time is wasted and disruption on teaching process due to MDM.

Separate toilet facility is available for boys and girls in all schools and only 37.2% schools currently using toilets and 30.2% schools have wash solution inside the toilet. Bore-well is the primary source of water for drinking and cooking purpose (55.8%), followed by tap water (24.4%) and hand pump (19.8%) while there is no evidence of using open well water source. The assessment of hygienic condition of

cooking areas in current study reveals that more than 50% of schools having fair and good hygienic condition in cooking areas with respect to its cleanliness and dryness. Only two schools rated highest with regards to hygienic conditions of cooking area. Cleanliness at the site of food serving is maintained at 91.9% schools and 55.8% of schools having multi-tap facilities and only 22.1% schools maintaining multi-cap system. School students usually sharing MDM and 100% of schools maintains social and gender equity. Only 18.6% of schools are having good drainage facility.

To ensure accountability, transparency and openness in all aspects of the programme, the quantity of food grains received, quantity of food grains utilized, other ingredients purchased and utilized, number of children given MDM and roster of community members involved in the programme on weekly / monthly basis, menu on daily basis etc. are displayed on a board hung in a prominent visible place in all educational institutions covered under MDM. Almost all schools having MDM displays such as logo, pancha-niyam and wall mounted height measuring scales in their school walls. More than 90% of schools displayed student helpline number, MDM menu, roster of community members, enrolment and attendance of students, display of rice stock, weighing scale and complain box respectively.

Future plan

The study is initiated in November 2017 and will continue as per protocol covering 30 districts on MDM program implementation in schools and quality of services and concurrent monitoring activities of stakeholders at each level of school, cluster, block, district and state for improving the quality of services. The impact evaluation will be done based on effectiveness of corrective measures on MDM in subsample of districts.

8. Prevalence of fluorosis in the community of Nayagarh districts of Odisha and development of an appropriate intervention model for prevention and control of fluorosis.

Principal Investigator : Dr.Sanghamitra Pati, Scientist-G & Director
Co-Investigators : Dr.G. Bulliyya, Mr.R.K. Das
Starting date : July 2017 (Ongoing)
Duration : 2 years
Funding : ICMR

Objectives:

Primary:

- To assess the prevalence of dental, skeletal and non-skeletal fluorosis in the community of selected districts in India;
- To find out the severity of dental fluorosis among areas with different fluoride levels in potable water;
- To assess fluoride level in potable water and urine samples;
- To develop an appropriate intervention model for prevention and control of fluorosis together with its feasibility of adoption with local stakeholders

Secondary

- To assess the dietary intake with special emphasis on high fluoride containing food items such as black tea, black salt, lemon tea etc
- To analyze the common foods for fluoride content
- To assess the nutritional status including anaemia and IDD

Background

Endemic fluorosis resulting from high fluoride concentration in groundwater is a public health

problem in India. The available data suggest that 15 states including Andhra Pradesh, Karnataka, Tamil Nadu, Punjab, Haryana, Maharashtra, Gujarat, Rajasthan, Uttar Pradesh, Kerala, Jammu and Kashmir, and Delhi are endemic and about 62 million people suffer from dental, skeletal and non-skeletal fluorosis, out of these 6 million children below the age of 14 years. According to Ministry of Drinking Water and Sanitation under National Rural Drinking Water Programme (NRDWP), fluorosis is alarming in 19 states, 17 lakh people are affected with contaminated fluoride in 43039 habitats. In India still there are several districts or habitations where ground water is the only source for drinking water as no surface water is available. According to WHO (1984) maximum permissible limit of fluoride in drinking water is 1.5 ppm and highest desirable limit is 1.0 ppm. Fluoride is a normal constituent of the enamel itself, low concentration (0.5 ppm) provides protection against dental caries. Fluoride concentrations above 1.5 ppm or mg/l in drinking water cause dental fluorosis and much higher levels may cause skeletal, non-skeletal fluorosis, osteosclerosis, thyroid, kidney changes and cardiovascular, gastrointestinal, endocrine, neurological, reproductive, developmental, molecular level and immunity effects.

Government of India (GOI 1986) introduced Technology Mission on Safe Drinking Water (changed to Rajiv Gandhi National Drinking Water Mission in 1990) for providing potable water to the people of rural India. As part of this initiative, control of fluorosis is identified as one of sub-missions to address the specific water quality problems in focused manner. The Sub-mission's activities started in 1987, with the aim to update and create awareness on the relation between fluoride and fluorosis, facilitate/conduct health and water quality surveys in the affected areas; and to introduce ameliorative and preventive measures for prevention and control of fluorosis. According to National Oral Health Survey and Fluoride Mapping in three states (Haryana, Uttar Pradesh and Andhra Pradesh 2002-2003), prevalence of fluorosis in children aged 12–15 years is 7.2%. Skeletal fluorosis is a crippling disease resulting from excessive exposure to high fluoride. Pain and stiffness in the back appear, especially in the lumbar region, followed by dorsal and cervical spines. Restriction of the spine movements is the earliest clinical sign of fluorosis. Non-skeletal fluorosis is the earliest manifestation of fluorosis that requires a high index of suspicion for diagnosis affects the body's soft tissue, ligaments, muscles, RBC, blood vessels, sperms and GI system,

Methodology

The present study is a cross sectional community based study covering 60000 population (>6 years of age) screening for dental, skeletal and non skeletal fluorosis in Nayagarh district covering 30 villages by PPS. Assuming 500 households and around 2000 population included in each selected village. In case of big/small villages segmentation or adjacent villages clubbing done to cover approximately 2000 population. To cover 2000 population in a village, assuming average family size as four, 12000-15000 households need to be covered for screening dental, skeletal and non skeletal fluorosis.

Household socioeconomic status, demographic information collected using a pretested proforma. KAPP regarding health issues, knowledge about the symptoms of fluorosis, general causes of fluorosis and source of drinking water are also recorded. The population is screened for dental fluorosis using ICMR index (2013) and Dean's classification. Skeletal and non-skeletal fluorosis assessed using available Index. Height and weight of all selected population is measured using standardized equipments. The dietary survey by 24 hour dietary recall and food frequency conducted on a subsample of 5% households (25) from each village emphasizing high fluoride containing

food items such as black tea, black salt, lemon tea etc. Raw food items-around 10 samples from each district collected for fluoride estimation. Urine samples for 5% households are collected for analysis of fluoride and iodine. Out of the 5% selected households, 50% samples collected from those having clinical symptoms of fluorosis. Urine samples collected from 5% of the households covering one child (<18 years) and one adult (>18 years) thus approx 3000 samples transported to NIRTH, Jabalpur for fluoride and urine preserved at 4°C to CNRT, New Delhi for iodine estimations. Ethical clearance obtained from Institute Ethical Committee and State Research and ethics Committee. Written consent in the local language is taken from all subjects after explaining them the purpose of the study. In case of children and adolescent girls, subjects assent and parents consent is obtained.

Progress

In the first phase, thirty villages were selected based on PPS sampling according to fluoride content in water based on information available from Ministry of Drinking Water & Sanitation under NRDWP website. The 30 villages were divided into 3 strata (<1.5 ppm, 1.5-3.0 ppm and >3 ppm) based on fluoride

Table 1: List of villages selected by PPS cluster sampling in Nayagarh district

Name of block	Selected villages (Population/Households)
1. NAYAGARH	1. Ikiri-463 +2 adjacent villages-1321 2. Jemadeipurpatha-1802+1 adjacent village-506 3. Kalahandi-558 + 2 adjacent villages-1911 4. Dhabalei-918 +1 adjacent villages-3099
2. NUAGAON	1. Dimiri padar-316 +3 adjacent villages-1948 2. Radhanathpur-649 +8 adjacent villages-1903 3. Senteri-1072+6 adjacent villages-1399 4. Korada-2115 5. Mahitama-1645+ 1 adjacent village-1103 6. Nuapalli-607 + 4 adjacent villages-1401
3. DASPALLA	1. Madhupur-551+2 adjacent villages-1655 2. Gobardhanpur-146+ 6 adjacent villages-2151 3. Saliagochha-312+ 4 adjacent villages-1833 4. Saradhapur-379+ 8 adjacent villages 1641 5. Sriramchandrapur-1042+3adjacent villages-1394
4. RANPUR	1. Brundabanpur-704+ 3 adjacent villages-2159 2. Benudharpur-93 + 3 adjacent villages -2175
5. BHAPUR	1. Dubapalli-704 + 3 adjacent villages-1579 2. Madhapur-3118 3. Padmabati- 35 + 1 adjacent village-3553 4. Baunsbati - 2334
6. ODAGAON	1. Hanumantia-1004+3 adjacent villages 1197 2. Madanpur-1142 +1 adjacent village-1448 3. Padmadeipur-2169
7. KHANDAPADA	1. Ranipada-2628 2. Raghunathapur-229 +1 adjacent villages-3857
8. GANIA	1. Bijayanagar-1502+1 adjacent village-1971 2. Narayanprasad-168+6 adjacent villages 1896

content of water (IPCS 2002). From each strata, ten villages were selected following simple random sampling. Sampled village having less than 2000 population, adjacent villages included from District Census data, 2011. The list of 30 villages selected across 8 blocks in Nayagarh district is shown in Table-1.

A total 512 water samples from all sources used for drinking and cooking were collected in 100 ml sterile pre-labeled polythene bottles with necessary precautions and transported to NIRTH, Jabalpur for analysis of fluoride concentration by ion selective method. The distribution of water samples in Nayagarh district shows that tube-well at 61.5% is the major source of water followed by deep well, shallow well, bore well, tap, river and pond (Table-2). The mean concentration of fluoride is 1.01, it is highest at 1.12 mg/l in deep well followed by tube well, shallow well, bore well, tap and river source of water. The proportion of water sources having fluoride content above the recommended level is tube well (23%) followed by deep well (18%), shallow and bore well (9%).

Block wise mean fluoride content of all water samples used from drinking and cooking reveals Khandapad and Odagaon show highest while Bhapur block shows lowest content of fluoride.

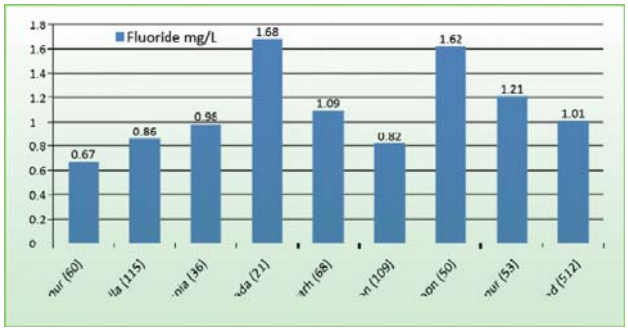


Fig.-1: Block-wised fluoride content (mean in mg/L) of water used for drinking and cooking in Nayagarh district, Odisha

The present study is carried out based on fluoride content of 512 water samples from all sources used for drinking and cooking purpose covering 30 selected villages across eight blocks in Nayagarh district. These villages have been divided again into 3 strata (<1.5 ppm, 1.5-3.0 ppm and >3 ppm) based on fluoride content of water. From each strata, ten villages were selected for community based survey to cover 2000 population in each village, hence total 60000 population from 30 village clusters.

Future plan

The study is an ongoing community based cross section and to assess the prevalence of fluorosis in 30 village clusters in Nayagarh district. The study covers household data on demography, socioecomic status,

Table-2: Fluoride content (mg/L) of water from used for drinking and cooking in Nayagarh district, Odisha

Water Source	Percent (n)	FluorideMean+SD	Fluoride strata mg/L or ppm		
			< 1.5	1.5-3.0	>3.0
Tube well	61.5 (315)	1.06+0.95	243	18.1 (57)	4.8 (15)
Deep well	18.0 (92)	1.12+1.67	75	9.8 (9)	8.6 (8)
Shallow well	12.5 (64)	0.85+1.21	58	6.3 (4)	3.1 (2)
Bore well	4.1 (21)	0.76+0.44	19	9.5 (2)	0
Tap water	2.7 (14)	0.56+0.56	13	7.1 (1)	0
River water	0.8 (4)	0.29+0.15	4	0	0
Pond water	0.4 (2)	0.33+0.01	2	0	0
Total	100 (512)	1.01+1.13	414	14.3 (73)	4.9 (25)

diet survey by 24h recall and food frequency, individual dental, skeletal and non-skeletal fluorosis, anthropometry, collection of raw food and urine samples.

9. Targeted Intervention to Expand and Strengthen TB Control in Tribal Populations under the Revised National Tuberculosis Control Programme, India (The TIE-TB Project)

Principal Investigator	:	Dr. Amarendra Mahapatra, Scientist-E
Co-Investigator	:	Dr. S. Pati, Director Dr. D. Bhattacharya, Sci.-C
Starting Date	:	June 2016
Duration	:	2 Years
Funding	:	(Global Fund) / EM
Close Date	:	June 2018

Background:

A large and deprived tribal population in India estimated at an approximately 104 million (8.6% of the total population) with a huge burden of TB requires services which are, truly & certainly, accessible and available. The extreme remoteness, intense deprivation from even a day's square meal and the harsh and isolated living environments primarily contribute to high vulnerability of and poor access to healthcare by these populations. As such, provision of TB services to the tribal population is not simply an issue of reducing the burden of TB in numbers but is a **'STANDARD OF CARE'** issue.

The gaps in service provision to the tribal population have been studied through two commissioned studies from the Central TB Division entitled 'Social Assessment Study under the Revised National Tuberculosis Control Programme' the first being conducted in 2005 and a follow up of the same concluded in 2011. To address these issues the project entitled 'Targeted Intervention to Expand and Strengthen TB Control in Tribal Populations under the Revised National Tuberculosis Control Programme, India (The TIES-TB Project)" is proposed. This project focusses on interventions of structured community engagement, focused involvement of traditional healers and spatially targeted usage of Mobile vans equipped with Digital X-ray and sputum microscopy services in an effort to improve access to TB care services and improve the health seeking behavior of the tribal populations. This effort essentially builds up further upon the tribal action plan being implemented under the RNTCP and will be a programmatic implementation. In this multi centric study coordinated by ICMR, RMRC, Bhubaneswar was assigned the Jharkhand State.

TB in the Tribal Population, the problem statement

The estimated tribal population in the country is an approximately 104 million which is 8.6% of the total population and is a sizable proportion of the total population of the country. However, a large majority of the tribal population is extremely remote, intensely deprived (of even a day's square meal), reside in scattered habitats (thereby being even more unreachable), have extremely low levels of literacy, low levels of awareness and continuing deep rooted belief in traditional healers. The Tribal are highly vulnerable and face a number of health risks. Their vulnerability can also be attributed, apart from the above-mentioned factors, to high rates of poverty, illiteracy, smoking, and alcohol use, as well as harsh and isolated living environments and poor access to healthcare. The combination of increased susceptibility to health afflictions, scarce availability and accessibility to health services and poor health seeking behavior poses challenges in the management of highly prevalent, communicable diseases, such as TB.

As regards the prevalence of TB in tribal population a meta-analysis has provided a pooled TB prevalence estimate of 703 per one lakh for the tribal population, which is significantly higher than that

estimated for India (256 per 1 lakh) (in press). This estimate greatly differs from the RNTCP annual report's estimate of 80 positive smear cases per 1 lakh tribal population. The meta-analysis demonstrated a large variability in tribal TB prevalence estimates among the different studies with poor representation of the various tribal groups. The moderate level of heterogeneity found across the studies suggests that the pooled-estimate needs to be treated with caution. Furthermore with passive case finding under RNTCP and the profile of these hard to reach group these estimates do no provide the true picture. The RNTCP vision is for a "TB free India" with reduction in the burden of the disease through 'Universal Access' for quality diagnosis, treatment and quality of services to all persons diagnosed with TB while focusing on reaching the unreached, the tribal population being one such group that requires attention.

Gaps in Access: Insufficient/poor physical access to diagnosis and treatment due to difficult terrain, sparsely distributed population in forest and hilly regions, long distance travel to reach the health centers, weak health infrastructure, non-availability & limited accessibility of health care providers remains a challenge. Public health services are often not client friendly because of variation in the timings and cultural beliefs. Insufficient community engagement, deep rooted belief in traditional healers continues to be major impediments in reaching out to the tribal populations.

Gaps in Awareness: Lack of awareness on TB, misconceptions of TB, lack of appropriate awareness building measures with language being a barrier, lack of integration with other health social and developmental sectors further limits their health seeking behavior delaying early initiation of TB treatment. Furthermore, limitations of **non-tribal health workers** familiar with the various dialects of the tribal population in motivating the tribal patients, poor commitment due to **lack of monetary rewards**, low literacy levels are some of the other issues identified. The service-beneûciary gap is particularly marked in the case of tribal populations in hilly and forested areas requiring local adaptations to ensure quality coverage.

Brief Summary

The delivery of effective RNTCP services to the tribal population is an issue of 'Standard of Care' and routine policies and strategies will continue to be ineffective in catering to these extremely remote populations. Clearly these populations 'need more' and bold strategies and initiatives need to be instituted to address the various challenges in reaching out to them.

The Indian Council of Medical Research (ICMR) under the Department of Health Research/Ministry of Health & family Welfare/Government of India, in collaboration with Central Tuberculosis Division (CTD)/Department of Health & Family Welfare/ MOHFW/GOI proposes to undertake this project in certain defined hard to reach, tribal areas spread over Western and Central parts of India. The project will be carried out in an implementation research mode wherein the interventions will be evaluated as per defined protocols through rigorous research methods qualitatively and quantitatively, thereby serving evidence to RNTCP for decisions on further policy designing & scale up to the entire tribal population. Cost effective and cost benefit analysis will also be undertaken which will add to the decision making for scale up of the interventions.

This project is being implemented in 5 States and 19 districts covering a total population of approximately 17.65 million and is expected to lead to an additional case finding of 7940 TB cases from the tribal population and more importantly improve the 'Standard of Care' among these extremely deprived populations which will be measured

through various programmatic and socio-economic indicators. The efforts will lead to early seeking of care and reduction in out of pocket expenditure of individual patients. The patients will have access to the correct and appropriate treatment regimen and will help in curbing of the individual patients from being directed to multiple providers for treatment which results in huge economic burden to the patient and his family. The effects of the intervention on various social aspects can also be underlined. For the programme and the country as a whole the efforts are expected to lead in more complete detection of TB cases in the tribal community and notified under the programme and reduction on indirect costs. Improved detection and notification of TB cases from the tribal population will imply more and more TB cases to have access to the correct and appropriate treatment regimen and thereby prevention of multi-drug resistance among these populations. Each of the identified institute of ICMR will work in close collaboration with the respective District Tuberculosis Officer (DTO) and the State Tuberculosis Officer (STO) in the respective district/state. The respective DTOs and STOs will be equal partners in the project and will also be responsible for the smooth execution of the project. The DTOs and the STOs will be actively involved from the planning stage itself and during the whole execution of the project.

Objectives

Strengthening TB Control in Tribal Populations

- Strengthen access to RNTCP services in the tribal population
- Promote early case detection and treatment adherence in the tribal population and overall improvement in the quality of the services
- Improve awareness on TB and RNTCP services through community based ACSM activities.

Strengthening TB Control in Tribal Populations - Interventions Proposed

The various interventions to be undertaken as against each of the objectives are detailed below.

Objective:

Strengthening TB Control in Tribal Populations; - Strengthen access to RNTCP services in the tribal population

Through Mobile Digital X-ray and Sputum Microscopy Vans for Geographically Remote Places (Spatial Targeting)

Selection of Remote Tribal Villages:

Since the health services have limited reach to the extreme remote locations of the tribal population it is necessitated that measures be instituted to reduce the reach of these populations in an effort to improve accessibility to health care services. Towards the same it has been planned to put in Mobile TB Diagnostic Van (MTDV) equipped with digital X-ray and sputum microscopy which will visit certain identified remote places in these tribal populations. These are Type –C Villages i.e. villages with no health facility within 2km radius. These remote places will be mapped beforehand and the MTDV will visit these locations at a defined frequency and time interval. These remote places will be defined as not having a subcentre within a radius of 2 Km and/or lack of a convenient transportation (defined as availability of at least one to and fro transportation service per day). In defining these remote locations considerations will also be made of aspects of patients having been detected from the various villages/hamlets in the last two years. Villages/hamlets from which patients have not been detected/barely detected under the RNTCP during the last two years will also be included for visit by the MTDV. A beforehand situation analysis will be done of each of these areas and such hamlets/villages will be defined and listed.

Expected Outcome: It is assumed that for a population of 17 million an approximately 17000 villages/hamlets will be existing (assuming a village has an average population of 1000). Of these 17000 villages/hamlets, it is expected that an approximately 5100 villages/hamlets will qualify for the above mentioned definition for remoteness. Each of these identified villages will be visited once at least every three months. Considering that on average 2-3 villages will be visited on each day and an approximately 50 villages per month, each MTDV is expected to cover 150 villages in three months. Hence to cover the identified 5100 villages an approximately 35 vans will be positioned. This MTDV van will be procured on a hiring basis and will be so positioned so as to cover the identified villages/hamlets in each district proposed for intervention. The van will visit all such hamlets/villages at least once in three months and more depending on circumstances.

The identified Community workers under the project will be trained to create TB awareness in community in order to sensitize and prepare the community before this exercise. Before the day of the scheduled visit the Community Worker will mobilize the TB suspects to be available for examination on the scheduled day of visit. The identified opinion leaders and traditional healers will also be roped in for this activity.

For sputum microscopy attempts will be made to obtain a morning and spot sample and if not possible two spot samples will be collected. The collection of morning sample will be facilitated through community worker who will be sensitized in sputum collection and will be equipped with sputum containers. This will be given to all TB suspects a day before the visit of MTDV. The TB suspects will as far as possible be encouraged to collect morning sample on the day of the visit of the van. The results of the sputum microscopy will be provided during the same day. The positive patients diagnosed will be referred through the community worker for treatment to the nearest PHCs and STS will be intimated to ensure that the patient access the treatment centre and is initiated on treatment.

Sputum of patients who test negative on sputum for AFB but have abnormal chest X-ray will be transported by the MTDV to district headquarters for testing by CBNAAT. It is expected that the CBNAAT machines will be installed in these districts by RNTCP. Alternatively also these patients will also be provided their sputum results and the image of the X-ray and will be referred to the nearest PHC through the community worker for further work up. All such patients diagnosed through the MTDV will be rigorously followed up for ensuring that the final diagnosis of each of these is established and the patient initiated on treatment.

(a) **Active screening** through house to house visit every three months

(b) Referral of TB suspects to the nearest DMC with the help of referral slips. These referral slips will be in a book let form with three parts, two will be given to the patient who will submit one to the LT and preserve other one and the counterfoil will be maintained by the community worker. When the result is made available this will be communicated to the community worker through the counterfoil. The LTs will be informed to make entries of the sputum results in the portion carried by patient and to maintain the other part in the centre for future referrals. The community worker will use this as a tool for monitoring of the referrals.

c) Prepare the community for the visit of the MTDV if this is a chosen area.

d) Conduct of TB awareness activities.

e) Serve as a DOT providers and ensure treatment adherence for each TB patient initiated on treatment

1. Tailor made culturally materials and tools will be developed for Community meetings of the above listed community members.

Involvement of Traditional Healers – though listed as one of the groups for involvement for promoting community engagement as outlined above, this will be a specific group for focus and attention. The activities for this group will be monitored separately. Evidence clearly shows that these are yet preferentially visited and are the initial points of contact for TB patients among the tribal population. These are readily available and are easily accessible (most importantly in terms of distance) to the patients which are the most important reasons for being preferentially utilized by the community for health care. The belief of the tribal population is deep and is set among the traditional values imbibed over generations and any confrontationist strategy with the traditional healers could only be counterproductive. Based on these premises it is strongly felt that the traditional healers need to be partnered with to improve the quality of the services in the tribal populations. The following activities will be undertaken in a structured manner for ensuring committed involvement of the traditional healers.

1. Line listing of the traditional healers

(a) A careful search will be undertaken to ensure line listing of each of the traditional healer

(b) Community meetings for each of the above groups at a defined frequency and time interval.

(c) Staff appointed exclusively for undertaking community engagement will be undertaking this activity too.

2. Preferential involvement as DOT providers

3. Tailor made materials and tools will be developed for Community meetings of the traditional healers.

The interventions outline in para 4.1 and 4.2 will be carried out in active collaboration with the programme functionaries. Both the activities will be primarily undertaken by the STS/Staff of RNTCP of the respective areas. The project staff (Field Supervisor) provided for field level activities will have the role of more of oversight and coordination and in ensuring that the activities are undertaken as per plan. The field supervisor will be stationed as per requirements. Each district will be necessarily provided with a field supervisor, however, population and geographical considerations will be importantly considered in positioning of the field supervisors.

It is estimated that to effectively ensure the above activities outlined at least 1 field supervisor per 5 lakh population will be required when working in concordance with the RNTCP paraphernalia. The respective STO and DTO will ensure that the respective programme workers will actively and effectively contribute to these activities.

Each of these field supervisors will be strictly recruited from the local population. The inability of non-tribal workers to work effectively among the tribal populations and also lack of monetary awards in effectively engaging the community workers have emerged as identified issues in the social assessment studies. Both the aspects have been addressed in the project. Thus, both the staff to be engaged in the project and also the community workers will be recruited from the local population and the community workers will be paid limited honoraria for the various activities performed.

Strengthening TB Control in Tribal Populations - Monitoring and Evaluation

The monitoring and evaluation for the project will as far as possible be integrated with the existent monitoring and evaluation system of the programme. However, to measure the performance of the project few differential modules will need to be inserted in the existing monitoring and evaluation system. Relevant records and reports will be placed to monitor the activities of the project. The responsibility of the MIS will lie with the programme as well as the project staff.

Strengthening TB Control in Tribal Populations– measuring the success

The interventions to be carried under Objective

Objective-wise expected outputs from the project and indicators for measurement

S.No.	Objectives	Expected outputs	Indicators for Measurement
1	**Strengthening TB Control in Tribal Populations**		
	Strengthen access to RNTCP services in the tribal population	Improved convenience to TB patients in terms of accessibility for diagnostic services	Number of patients diagnosed through MTDV; decrease in out of pocket expenditure of patients
	Promote early case detection and treatment adherence in the tribal population and overall improvement in the quality of the services	Improved case finding under the programme; reduced default rates	Additional case finding from the project; Number of days required for patient to seeking health care after developing symptoms; Number of providers visited before coming to RNTCP
	Improve awareness on TB and RNTCP services through community based ACSM activities	Community workers involved and sensitized in TB services; Increased number of opinion leaders in the community made aware of programme services	Number of community workers registered for working in the programme; Number of traditional healers involved in the programme

MTDV Activities Report August 2017 to JANUARY 2018

State _____ JHARKHAND _____

Sl. No.	District	No. Of Camp Organised	No. of Villages Covered	Average Population of Village Covered	No. of presumptive TB cases whom samples collected	No. of Sputum Examination	No. of Sputum +Ve Found	No. of X-Ray Done	No. of X-Ray +Ve	No. of TB Cases Initiated on Treatment
1	Gumla	78	94	79946	1036	1036	25	1164	177	94
2	west singhbhum_	77	166	104088	673	673	40	503	175	86
3	Dumka	74	286	107688	948	948	43	734	135	122
	TOTAL	**229**	**546**	**291722**	**2657**	**2657**	**108**	**2401**	**487**	**302**

3.1 will be evaluated as per defined protocols through rigorous research methods qualitatively and quantitatively, thereby serving evidence to RNTCP for decisions on further policy designing and scale up to the entire tribal population. Cost effective and cost benefit research will also be undertaken which will add to the decision making for scale up of the interventions.

A base line study was undertaken to understand the situation in the tribal population identified for implementation of the project and also obtain the baseline values for the indicators such as delay in seeking care, delay in treatment initiation, out of pocket expenditure, work absenteeism. During the end of the project, an end line study was undertaken to measure the above values and various other aspects to measure the achievements of the project. Cost effective and cost analysis is also undertaken which will serve as evidence to scale up the activities of the project to the entire tribal population. These studies are done on an appropriate sample picked up from the intervention sites. Appropriate research methodologies will be used for conducting these studies. Both these studies will be conducted under a common protocol for comparison of the results of endline study and baseline study.

Objective-wise expected outputs from the project and indicators for measurement.

So far the activities are going on in Jharkhand state. The recruitment process was over and after orientation training the baseline survey was conducted. After that the team prepared different line listing in type –C villages and organized camps. District wise camp details are 229 in total, with 302 extra cases detected by X-ray besides 108 sputum positives from these remote villages. The sputum positivity was 4.1% and the X-ray positives were 20.3% (of the sputum –ve patients) out of which treatment initiated was 11.4% among these positives.

The new MTDVs fabricated was successfully demonstrated in field of tribal dominated pocket of Jharkhand.

10. Study on the effectiveness of food supplementation on treatment outcomes and nutritional status of Adults with Pulmonary Tuberculosis in Odisha.

Principal Investigator	:	Dr. Amarendra Mahapatra, Scientist-E
Co-Investigators	:	Dr.S. Pati, Director Dr. G. Bulliya, Scientist-E Dr. Dasrathi Das, Scientist-E
Starting Date	:	Aug 2016
Duration	:	2 years
Funding	:	EM (Tata Trust)

Background:

Tuberculosis (TB) remains one of the major infectious causes of morbidity and mortality worldwide. Effective drugs are available, but a long period of treatment and high levels of compliance are necessary to achieve a cure. Addressing comorbid conditions has value for improving access and response to TB treatment and it should be considered as part of the standard of care for people with TB.

Nutrition and Tuberculosis: Undernutrition is both an important risk factor for, and a common consequence of, TB. It is therefore a common comorbid condition for people with active TB and is associated with increased risk of mortality and poor treatment outcom. Most individuals with active TB are in a catabolic state and experience weight loss and some show signs of vitamin and mineral deficiencies at diagnosis. Weight loss among those with TB can be caused by several factors, including reduced food intake due to loss of appetite, nausea and abdominal pain; nutrient losses from vomiting and metabolic

alterations caused by the disease. Undernourishment, low body mass index (lower than 18.5kg/m^2) and lack of adequate weight gain with TB treatment are associated with longer time to sputum conversion (6), higher risk of hepatotoxicity, higher risk of TB relapse and also increased risk of mortality. Undernourished patients have malabsorption of drugs like rifampicin and can contribute to treatment failure and development or drug resistance. Even among the contacts of TB patients, undernourishment is considered as a risk factor for development of active TB.

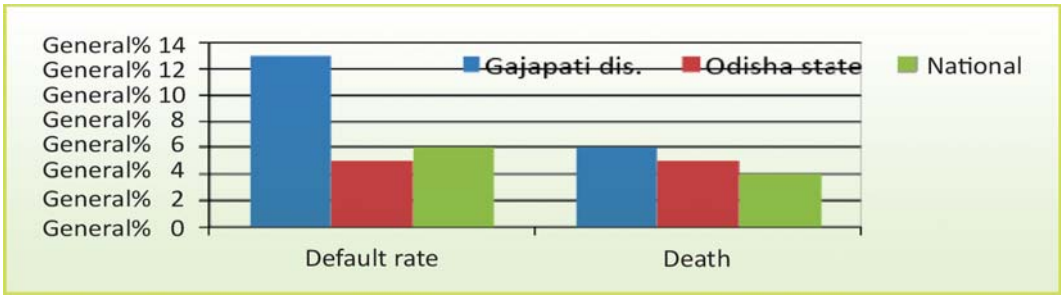
Social determinant of Malnutrition and TB: Because undernutrition increases the risk of progression from TB infection to active TB disease, food insecurity and poor general nutritional status in the population are important contributors to the global burden of TB disease. Majority of all TB cases are among people who are 15-54 years of age and in their prime working years. TB aggravates poverty as patients are often too sick to work and their families have to pay expenses associated with treatment like travel to treatment centre, nutritious diet.

Macronutrient requirements in active TB: There is currently no evidence to suggest that the proportion of dietary energy from macronutrients is different for people with active TB than those without TB. It is generally recommended that all people consume approximately 15-30% of energy as protein, 25-35% as fat and 45-65% as carbohydrates (13). Studies have shown that subjects who receive food supplements during TB treatment tend to gain more weight compared with those not receiving food supplement (4, 14). However the increase in weight gain has not been associated with improvement of TB treatment outcome. Under nutrition is an important modifiable risk factor for TB at the population level. A large study from rural India where the nutritional status of rural patients with pulmonary TB was studied, showed 80% of women and 67% of male had moderate to severe under nutrition and weights did not return to normal even at the end of treatment. From earlier days to recent times, nutritional supplements to TB patients have not only shown weight gain but also shorter time to sputum conversion, higher cure rate and better performance status. India with highest burden of TB and under nutrition is yet to come up with a strategy to overcome this interlinked epidemic.

Gajapati District, Odisha: Gajapati district is one of the poor performing districts of the State Odisha. As of I quarter of 2014, this district with a population of 6 lakhs, has 2 TUs and 11 DMCs. Each TU covers approximately 3 lac population. Every quarter approximately 150 smear positive cases of TB are detected under RNTCP; Cure rate of NSP is around 73% with a default rate varying from 7-13% in this district.

In the first quarter of 2014, 162 smear positive patients were diagnosed of whom 118 were new smear positives (NSP) registered for treatment (85 males, 33 females). Majority were between the age groups of 25 to 54 years. During the same period, the 3-month

Fig.: Shows default and death rates among NSP cases in I quarter (2013).



conversion rate of NSP was 79% and cure rate of NSP patients was only 70.9%, much below the national average. Initial defaulters were around 10%. Few of the blocks in the neighboring district of Rayagada and, Kandhammal also show similar low cure rates and high default rates. Difficult to reach areas, lack of pre-treatment counseling are few of the reasons quoted for lack of follow-up, high default rates and hence low cure rate in this region.

Objectives:

Primary Objective:

- To assess the effectiveness of food supplementation on the treatment outcome of cure rates and loss to follow-up.

Hypothesis: We hypothesize that a higher proportion of new sputum smear positive pulmonary tuberculosis patients, treated with anti-TB treatment along with a food supplement will go on to complete their treatment resulting in lesser loss to follow-up and a higher cure rates as compared to cure rates in this district prior to this intervention.

- **Secondary Objective**: (i) To **evaluate the impact of a food supplement on the nutritional status** of adults with new sputum smear positive pulmonary TB attending RNTCP centers in Gajapati district and few blocks of Rayagada, Kalahandi and Kandhammal districts of Odisha.

Hypothesis: We hypothesize that tuberculosis patients with low body mass index (BMI < 18) treated with anti-TB treatment along with food supplement will have faster reconstitution of body weight and improvements in lean body mass and other anthropometric parameters as compared to those who receive only anti-TB treatment (historic controls).

- **To assess the Quality of Life** and return to normal functionality among patients receiving food supplement along with anti-TB treatment.

Hypothesis: We hypothesize that tuberculosis patients treated with anti-TB treatment along with food supplement will **return to work (normal functionality) much earlier and better quality of life** than those who receive only anti-tuberculosis treatment.

Methodology

Study site:

- 11 DMCs of the 2 TUs in Gajapati district of Odisha (DTC-TU and Chandragiri – TU) (6 blocks)
- 2 blocks in Rayagada & Malkangiri and 1 Block each at Kalahandi and Kandhammal district of Odisha with 1 DMC each.

Now the Final sampling frame will be as follows: 12 Blocks in 5 Districts of Odisha.

- Gajapati- Guma, Kasinagar, Mohana, Nuagarh, R. Udaygiri, Rayagad,
- Rayagada- Bisam katak & Munniguda
- Kalahandi- Lanjigarh
- Kandhamal- Kotgad
- Malkangiri- 1. Mathili & 2. Pandripani

The oral food supplement will consist of

a) Rice (20 kgs) {Iron-fortified rice – if feasible & available},

b) Ragi (10kgs),

c) Local Arhar dhal (Kandol) (9 kgs)

d) Mustard Oil (2 kgs)

e) "Sathu" (flour made from groundnut, wheat, flat rice and chickpea)-1kg / month

Study Design: **Step wedge design** (Phased Implementation)

Step wedge design (Phased Implementation) is particularly useful when it is not feasible to provide the intervention to every individual/community at

once. The intervention is rolled-out sequentially to the trial participants (either as individuals or clusters of individuals) over a number of time periods. The order in which the different individuals or clusters receive the intervention is determined at random and, by the end of the random allocation, all individuals or groups will have received the intervention. This design is for evaluating the effectiveness of interventions that have been shown to be efficacious in a more limited, research setting and are now being scaled up to the community level and also useful for evaluating temporal changes in the intervention effect.

Data analysis to determine the overall effectiveness of the intervention subsequently involves comparison of the data points in the control section of the wedge with those in the intervention section (19).

For this study, we will consider 5 clusters consisting of 4 DMCs each in first 4 clusters and 3 DMC in the last cluster {4, 4, 4, 4, 3}. While patients are being enrolled to intervention in cluster 1, the other 4 clusters will be the control group. After every three months, the next cluster will begin enrolling patients to the intervention until all the four clusters are enrolling. The enrolment to study will stop in all the clusters when the last cluster has been enrolling for three months.

The logistics of Step-wedge design trial design is shown below:

Eligible Patients

A patient will be eligible for the study if he/she

- Is new sputum smear positive pulmonary TB yet to initiate ATT or recently initiated ATT (within < 3 doses or 7 days)
- Is willing to sign informed consent form; adhere to the follow-up schedule and to study procedures once food supplement along with ATT is initiated

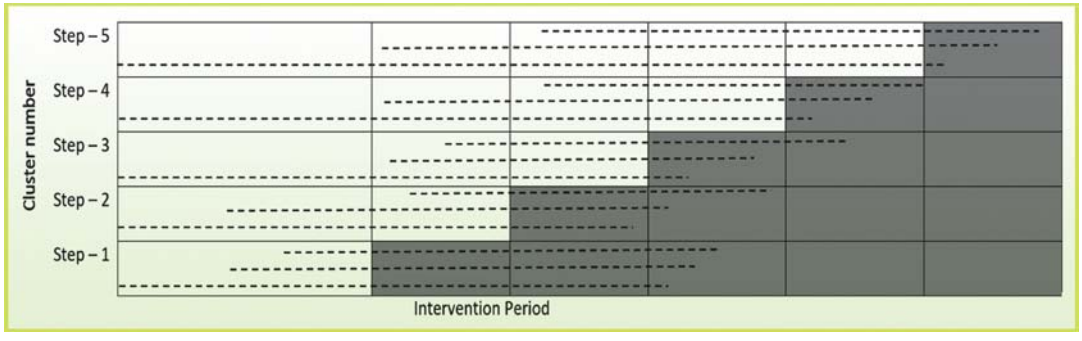
Ineligible population

A patient will not be eligible for oral food supplement if he/she:

- Is allergic to pulses / nuts
- Is unwilling to sign the consent form and is unable to attend or comply with treatment or follow-up schedule
    - Every attempt will be made to motivate such patients to participate in the study, find reasons for his denial and take corrective steps to rectify that. However, if patient is still unwilling to receive the food supplement, a note of that will be made along with reasons for his denial.

Methodology

Baseline assessment: Prior to issuing the supplement baseline assessment will be done. A detailed clinical and demographic history will be collected including past medical history, family and



personal history (smoking, alcohol and substance abuse). A brief physical examination will be done and anthropometric measurements (height, weight and mid-arm circumference) will be measured and recorded. Wherever feasible, food intake will be assessed by retrospective 24-hour dietary recall by a trained study staff. Nutrient intake will be calculated using "Digest" software, a specially designed software package to analyze Indian diets. Sputum results and current treatment detail will be collected from RNTCP lab register and Treatment card. 5ml of blood will be collected on a sub-set of patients to assess the nutrient content (both vitamins and micronutrients) in blood before initiating food supplementation, to assess protein, vitamin and micronutrient content in plasma. (the sub-set selection will be decided subsequently)

Patient will be counselled about the study and its procedures and informed written consent will be obtained before enrolling to the study. He/she will be motivated to be regular with treatment and sputum examination, need of nutritious diet and adherence to the food supplement.

Food Supplement: The oral food supplement will consist of Rice (20 kgs) {iron-fortified rice – if feasible & available}, Ragi (10kgs), Local Arhar dhal (Kandol) (9 kgs), Mustard Oil (2 kgs) along with 100 gms of "Sathu" (flour made from groundnut, wheat, flat rice and chickpea) per month. (The type of pulses and oil are added based on local tastes and preferences). This is planned in such a way so as to support a family of five for one month. This will be supplied to the Index patient as fortnightly packs and will be issued to him/her at his/her DOTS treatment center through the study staff till the end of his/her treatment period.

Nutrition counseling: Staff will be trained to nutritionally assess, counsel and monitor the intake of nutritional supplement being provided to the patients on ATT at the DMC/DOTS treatment centers as well as their homes.

Follow-up: While coming to collect the food supplement, patients will be followed up every month, with a brief clinical exam, anthropometry, dietary recall and drug adherence. All patients will be de-wormed once every month. Sputum results will be collected from RNTCP records where it will be done at pre-treatment, end of IP, 4th month and 6th month. (In case of extension of IP, sputum exam is done at 3rd, 5th and 7th month as per RNTCP guidelines). 5ml of blood will be collected on sub-set of patients to assess the nutrient content (both vitamins and micronutrients) in blood at end of 6 months of supplementation. Quality of Life and Lung health will be assessed by standardised and validated scales (like WHO BREF QOL scale) for Indian population. Adherence to the ATT and food supplement will be ensured by surprise home visits and requisitioning of patient during monthly visits.

Besides the study participants, additional food packets will be given to the other TB patients on treatment attending the study sites. They too will be followed as an observational cohort and minimal details like symptoms, weight, height, sputum smear status etc. will be collected from them. A technical advisory group (TAG) consisting of NIRT, RMRC Bhubaneswar, State focal point RNTCP Odisha, Tata Trust and Central TB Division / WHO representative will meet on a regular basis during the course of the study, to review progress and suggest mid-course corrections in case required.

Statistical Analysis

Sample size calculation: From RNTCP's TB India 2014 - Annual Status Report, the treatment success rate of new smear positive cases in Gajapati district is 73%, as compared to the national average of 90%. We assume that with our food supplement, by improving the adherence rate, the treatment success rate will

increase to 90%. In the study area, there are 19 Direct Microscopy centres (DMCs) (Average of 5 cases per month at each DMC) that record 285 new smear positive cases (NSP) per quarter i.e., approximately 1140 per year.

Stepped Wedge design is adopted for this trial of 12 months. We have 5 steps: 4 steps with 4 DMCs each (i.e., 4 clusters with 4 DMCs each) and 1 step with 3 DMCs (one cluster with 3 DMCs). There are one baseline measurement and 3 during-intervention follow-up measurements (t) (at 2, 4 and 6 month – as per RNTCP guidelines). The intervention will be rolled out among these clusters in a time interval of 3 months. Outcomes (sputum smears) are measured on the study participants in all clusters at every time period, hence measurement of outcomes takes place at each step in the wedge; each cluster provides data points in the control and intervention conditions allowing each site to act as its own control.

Assuming an intra cluster correlation of 0.05 (Lewin et al., 2005), 95% confidence level, 90% power and 20% of refusals/loss to follow-up, the required sample size is 703 patients over a period of 1 year. The clusters will be randomized to one of the 5 dates to start the intervention, time and hence the sequence of units (clusters) that will start the intervention at each period is determined by random allocation. The randomization occurs before the start of the trial.

Statistical Analysis plan

- With primary outcome as bacteriological conversion rate, comparison of the same in the pre and post intervention periods will be reported. Baseline data collected from the first time period will be tabulated by order of implementation, grouping the clusters into five groups of nineteen clusters. This will include conversion rate, mean age, sex, and other process measures.
- In the primary analysis, conversion rate will be modeled using mixed effects logistic regression with random cluster effects allowing inclusion of baseline risk factors such as co-morbid disease etc., and adjustment for a fixed time effect between intervention periods.
- We will examine the adequacy of our randomization and include any DMC level variable unbalanced at baseline in our final model.
- The patient level covariates to be included in the model will be finalized prior to analysis. Tim to event analysis will be carried out using a Cox proportional hazard's model with fixed and random effects.

Study Outcome:

The study out comes can be measured by increase in the cure rate and increase in the body weight & BMI.

- Proportion of patients and amount of gain in the body weight, BMI, lean body mass and fat mass from pre-treatment level.

Table -1 PHASE-I

	Block/CHC	DMCS	Patient enrolled for Supplementation
1.	Raygada	Raygada	28
2.	Gumma	Gumma	09
3.	Mohana	Adava	18
		Mohana	08
		Chandragiri	09
	Total:		**72**

Table -1 PHASE-II

	Block/CHC	DMCS	Patient enrolled for Supplementation
1.	Nuagar	Khajuripada	08
2.	R. Udayagiri	R. Udayagiri	07
3.	Khasinagar	Khasinagar	08
		Khandaba	-
	Total		**23**

- Change in quality of life from the baseline as assessed using WHO BREF QOL scale and Time to return to normal (pre-treatment) physical activity level
- In this study the 1st step of enrollment has started in 3 blocks and the 2nd step is also on going in another 3 blocks, which is depicted in Table-1 & 2. This project will create a documentary evidence of the importance and need Nutritional Supplementation along with ATT compliance.

11. Bionomics of malaria vectors and their sibling species, and establish their role in malaria transmission in Odisha, India.

Principal Investigator : Dr. R. K. Hazra, Scientist-E
Co-investigator : Dr. N. Mahapatra, Sci.-F
Dr. M. M. Pradhan Joint Director, NVBDCP, Odisha
Coordinator : Dr. Sanghamitra Pati, Scientist-G & Director
Start year : 2017
Duration : 1 Year

Objectives:

- To assess the indoor and outdoor resting proportions of vector species during different seasons
- To assess host biting preference, biting rhythm and peak biting activity of vector species during different seasons
- To assess the sites of transmission
- To assess the susceptibility status of vectors against different insecticides.

Background:

Malaria poses the greatest public health problem in Odisha. Though Odisha accounts for 3% of India's total population, yet **43.6%** of total malaria cases of India is seen here with **58.2%** of *P.falciparum* cases and **33%** of death cases. (NVBDCP, Oct 2016). Malaria continues to be the major cause of morbidity and mortality and is prevalent in rural and urban areas. Although all age groups are affected, children and pregnant women are most vulnerable. However, the most vulnerable are the SC & ST population, and people from the low socio-economic, marginalized and disadvantaged background. The dynamics of these diseases are largely determined by eco-epidemiological, socio-economic and environmental management systems. Malaria epidemiology in India is complex with 9-10 *Anopheles* species transmitting predominantly *Plasmodium falciparum* and *P. vivax* malaria in different parts of the country. Vector control is one of the major components of malaria control under the National Vector Borne Disease Control Programme (NVBDCP). To plan an effective vector control strategy there is a need to have information on prevalence of vector species and on their biological characteristics and bionomics. Though lot of work has been done in the country and several papers have been published, still information on early biting and relative proportions of outdoor and indoor resting vector species, and sites of transmission other than the indoors (human dwellings and mixed dwellings) for areas where *An. culicifacies*, *An. fluviatilis*, *An. baimaii* and *An. minimus* are prevalent is missing and in some areas it is incomplete. In order to generate these data this protocol has been developed.

Summary of work progress:

The study was conducted in two districts of Odisha covering different eco-system viz Angul and Kalahandi. In Angul district two CHC was selected i.e Pallahada and Madhapur, in Kalahandi district two CHC i.e M.Rampur and B.N pur was selected. From each CHC two Sub-centre were selected and five villages from each sub-centre were taken with different ecotypes.

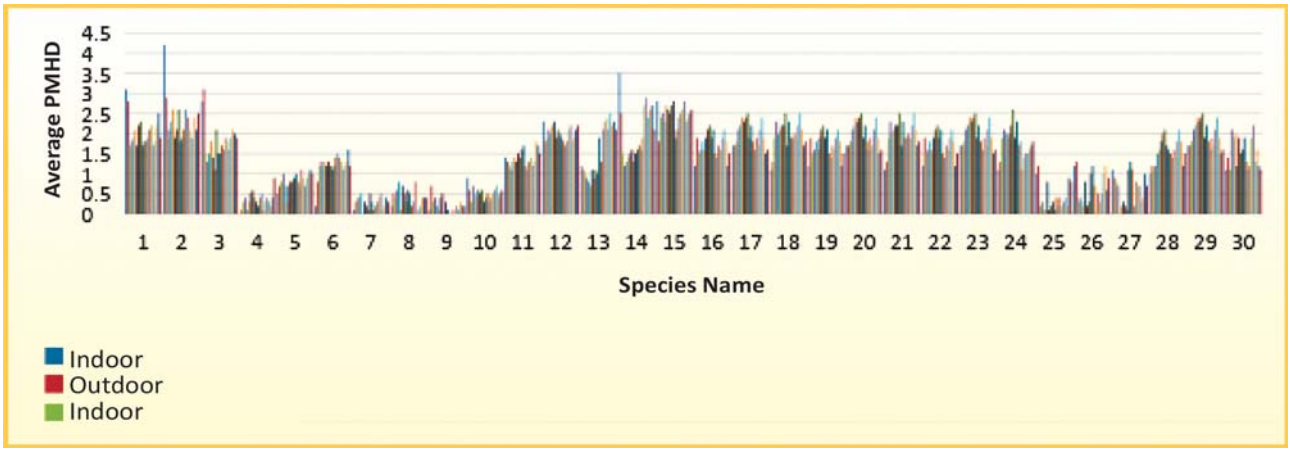


Fig 1: Village wise Indoor and outdoor hand catch collection expressed in PMHD in year 2017 in Kalahandi.

Density of the primary vector, An. culicifacies was found to be predominant during post monsoon season.

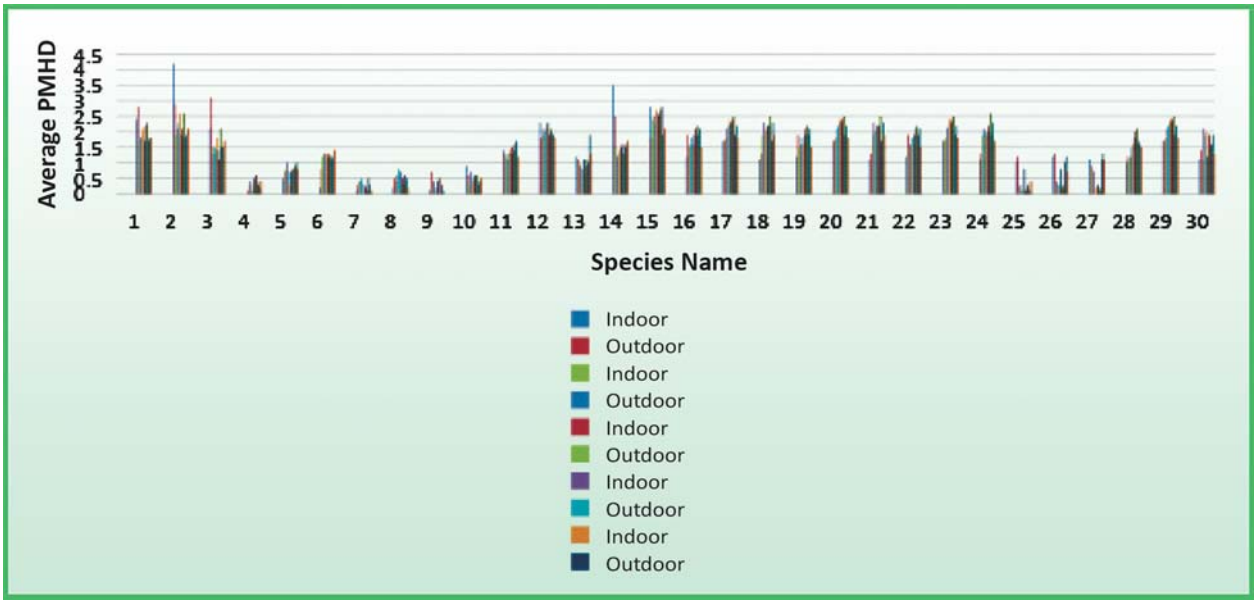


Fig 2: Village wise Indoor and Outdoor hand catch collection expressed in PMHD in year 2017 in Angul.

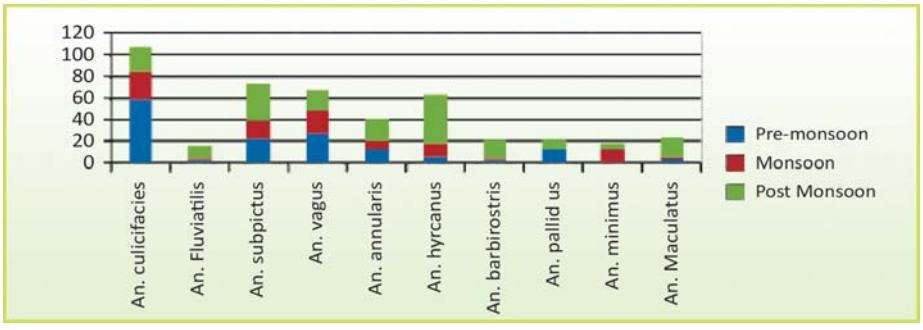


Fig 3: Light trap collection expressed in numbers in Kalahandi district during the month June-November 2017.

Light trap collection in Kalahandi district of Odisha during June-November2017. It revealed a total of 147,105 and 202 specieswere collected in pre-monsoon, monsoon and post monsoon season respectively. The primary vector species *An. culicifacies* was found in majority in pre-monsoon and monsoon period whereas *An. fluviatilis* were quantitatively less collected. *An. annularis* were found to be pre-dominant in post monsoon season.

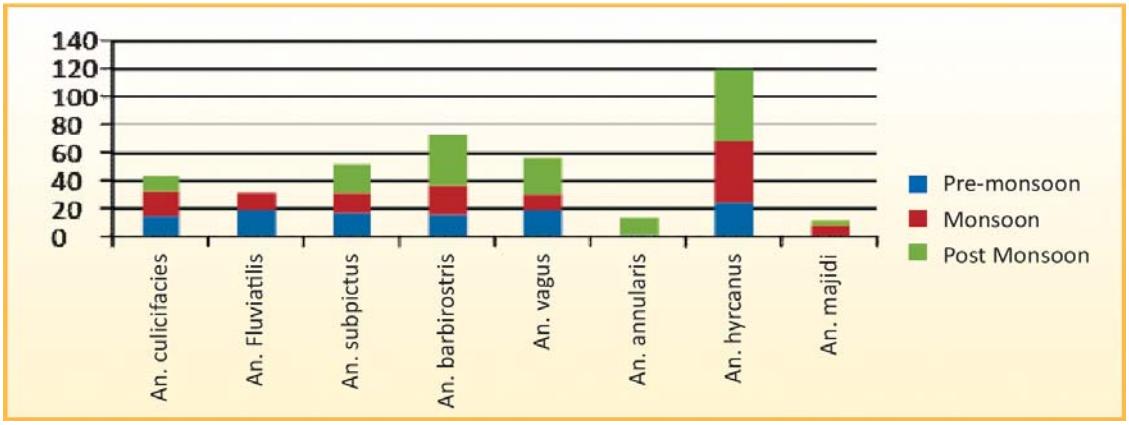


Fig 4 : Light trap collection in Angul district during the month June-November 2017.

In Angul district *An. culicifacies* density was found to be more by light trap collection method. The non-vector species *An. hyrcanus* was found to be dominant in all the seasons in this district.

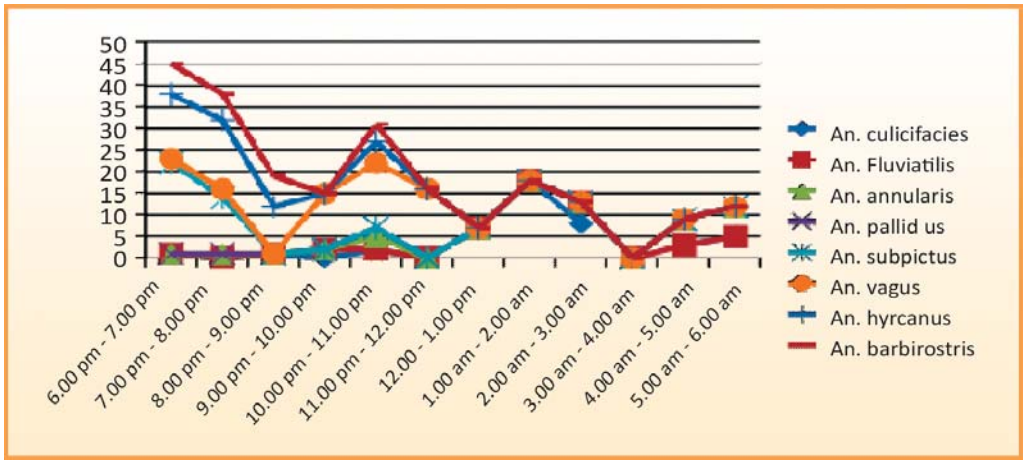


Fig 5. Landing collection in village Urladani (Ecology- Hill top) of district Kalahandi on 10 July 2017.

Landing collection in Urladani village (Ecology- Hilltop) of Kalahandi district during July 2017. It revealed a total of 225 species landed on wall during 6pm to 6 am were collected among which 20% of species were found to be *An. culicifacies*. The most preferred bitting time of *An. culicifacies* was from 1 AM to 2 AM. Among the other primary vectors *An. fluviatilis* preferred mostly during midnight i.e. 2 AM to 3 AM.

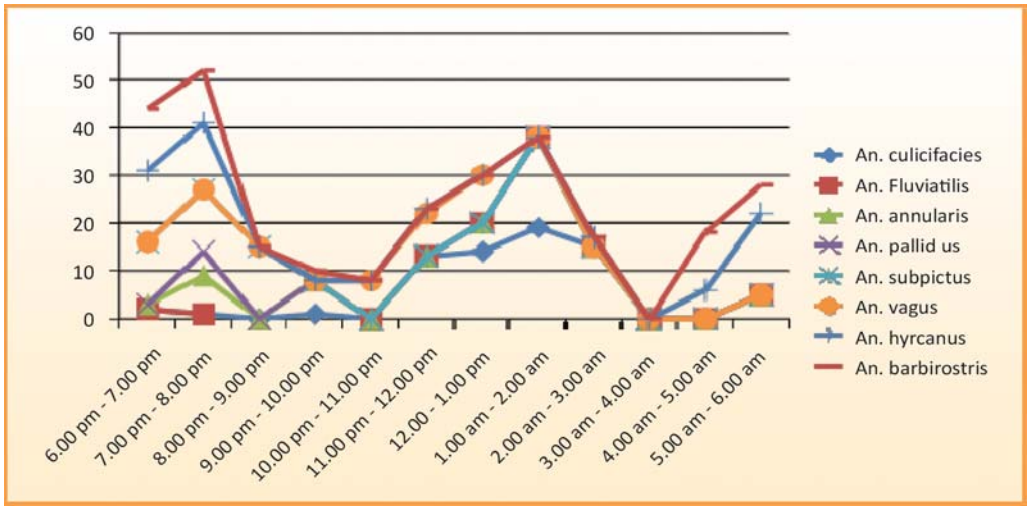


Fig 6. Landing collection in village Belgaon (Ecology- Plain and forested areas) of district Kalahandion 24 July 2017.

Landing collection in Belgaon village (Ecology- Plain and forested areas) of Kalahandi district during **July** 2017. It revealed a total of 283 species landed on wall during 6pm to 6 am were collected among which 24.7% of species were found to be *An. culicifacies*. The most preferred bitting time of *An. culicifacies* was from 1 AM to 2 AM. Among the other primary vectors *An. fluviatilis* preferred mostly during midnight i.e. 1 AM to 2 AM.

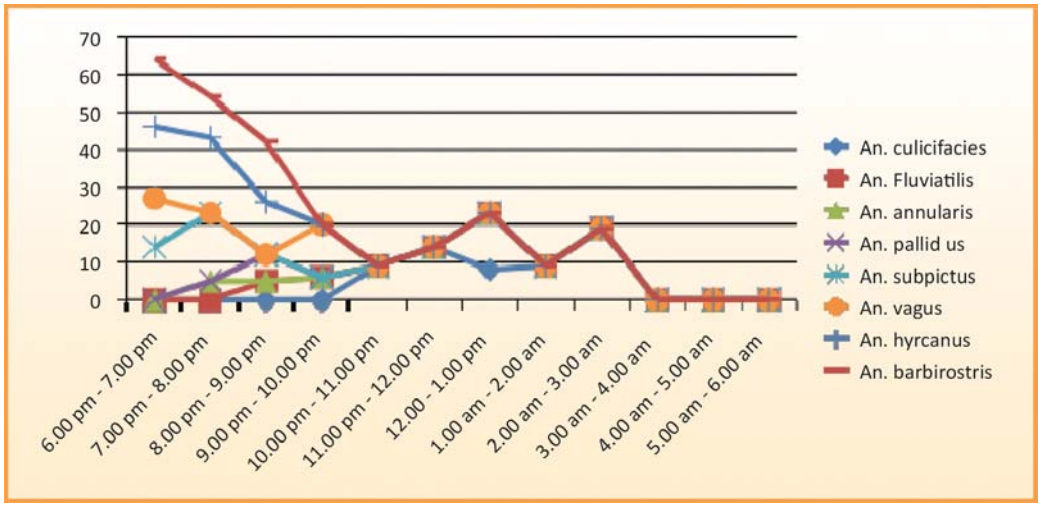


Fig 7. Landing collection in village Kiakata (Ecology- Hill top) of district Angul on 15th November 2017.

Landing collection in Kiakata village (Ecology- Hilltop) of Angul district during November 2017. It revealed that a total of 254 species landed on wall during 6pm to 6 am were collected among which 23% of species were found to be *An. culicifacies*. The most preferred bitting time of *An. culicifacies* was from 2 AM to 3 AM. Among the other primary vectors *An. fluviatilis* preferred mostly during midnight i.e. 12 AM to 1 AM.

Table 1: Larval collection from district Kalahandi during Oct-2017.

Habitat		Larval Collection	
	Checked	Positive	% Positive
Stream	13	6	46
Pond	11	4	36
Rice field	14	11	78.5
River bed pools	9	6	66.6
Total	**47**	**27**	**57.4**

A total of 35 Dips were checked from different habitats which included streams, ponds, rice fields, river bed pools of which 57.4% were found positive. Highest percent of larva collection was found from rice field (78.5%) followed by river bed pools (66.6%).

Table 2: Larval collection from district Angul during Nov-2017.

Habitat		Larval Collection	
	Checked	Positive	% Positive
Stream	6	2	33.3
Pond	10	4	40
Rice field	18	12	66.6
River bed pools	12	10	83.3
Total	46	28	60.8

A total of 18 Dips were checked from different habitats which included streams, ponds, rice fields, river bed pools of which 60.8% were found positive. Highest percent of larva collection was found from rice field (66.6%) followed by river bed pools (83.3%).

Susceptibility Status of vector species: The insecticide susceptibility test was conducted for *An. culicifacies* in Barabandha village of Kalahandi district concluded that the former being resistant to 4% DDT and completely susceptible to Cyfluthrin after exposure of 1hr.

Table 3: Susceptibility status of vector species in ecological paradigm.

PHC	Village	Ecology	Species	Insecticide used	Mosquitoes exposed	Time of exposer	Mortality	% mortality	Temp ^{0}C
Belgaon	Barabandha	Foothill	*An. culicifacies*	DDT 4%	15	1hr	0	0	34
						24hr	2	13.3	
Belgaon	Barabandha	Foothill	*An. culicifacies*	OC-Control	15	1hr	0	0	34
						24hr	0	0	
Belgaon	Barabandha	Foothill	*An. culicifacies*	Cyfluthrin	15	1hr	2	13.3	34
						24hr	11	73.3	
Belgaon	Barabandha	Foothill	*An. culicifacies*	PY-Control	15	1hr	0	0	34
						24hr	1	6.6	

Table 4. Sibling species identification for *An. culicifacies* and *An. fluviatilis* in Kalahandi and Angul district.

Sl no	District	Species	Sibling Species
1.	Kalahandi	*An. culicifacies* *An. fluviatilis*	A,B,C,D,E S,T
2.	Angul	*An. culicifacies* *An. fluviatilis*	B,D,E S,T

Sibling Species Identification: Sibling species for *An. culicifacies* and *An. fluviatilis* were identified through AS- multiplex PCR (Allele specific) which is given in Table 4 .

Table 5: Human blood index and Sporozoite rate of major Anopheline vectors in Kalahandi and Anguldistrct.

District	Species	HBI (%)	SR (%)
Kalahandi	An. culicifacies	5.4	2.6
	An. fluviatilis	Not tested	
Angul	An. culicifacies	3.2	0.66
	An. fluviatilis	4.6	0.22

Discussion:

The results of study will bring out basic bio-ecology, seasonal prevalence viz. feeding habit, resting habit and susceptibility status etc. which would be useful in selective vector control particularly delimiting areas for bed nets, fish application and spraying etc.

Future work:

- Comparisions between parasite incidences with EIR.
- Cuase of Increasing of API in Biswanathpur.
- Bitting habit of outdoor habitat in evening hour.

12. Comprehensive vector mapping in high endemic districts of Odisha

Principal Investigator : Dr. R.K.Hazra, Scientist-E
Co-investigator : Dr. N. Mahapatra, Sci.-F
Dr.M.M. Pradhan, Dr. Kirti Mishra (NVBDCP, Odisha)
Duration : 1 year
Funding : ICMR

Background:

Odisha between Latitude 19° 3' N to 21° 5' N and Longitude 82° 30′ E to 83° 74' E is 16,000 square miles (41,400 square km). Though the malaria data available from NVBDCP, Odisha shows a low API from the coastal districts, death cases are still reported with low transmission of Malaria from these districts. Therefore, a study is proposed to be undertaken in high endemic districts of Odisha to map the mosquitoes responsible for transmission, bionomics, and vectorial attributes of vectors which will help to develop an appropriate demonstrable vector control strategy for further control of the disease.

Objectives:

- To assess the pattern of disease transmission and distribution of vectors at Sub center levels in Coastal districts.
- To study the bionomics and vectorial attributes of malaria vectors in the coastal districts of Odisha

- To develop situation specific comprehensive malaria control strategy in Odisha.

Methodology:

Study sites: Seven coastal districts viz. Bhadrak, Cuttack, Jajpur, Jagatsinghpur, Khurda, Puri, and Mayurbhanj were undertaken for vector surveillance and for planning malaria control strategy.

- From each district 2-3 CHCs were selected on the basis of variable malaria endemicity and from each CHC at least 3/4 villages will be selected
- In each village, studies were undertaken to cover pre-monsoon, monsoon, post monsoon and winter seasons.

1. Mosquito collection
    - Indoor collection
    - Outdoor collection
    - Spraysheet collection
    - Light trap collection
    - Landing collection
    - Larval collection
2. Vector incrimination (Sporozoite rate)
3. Blood meal preference
4. Sibling species identification
5. Parity rate
6. Insecticide susceptibility status

Larval density of *Anopheles* species was found to be more in Mayurbhanj district where as it was least in Cuttack district. Jajpur, Mayurbhanj and Jagatsinghpur had higher larval density during monsoon, post-monsoon and winter period respectively.

Summary of work progress:

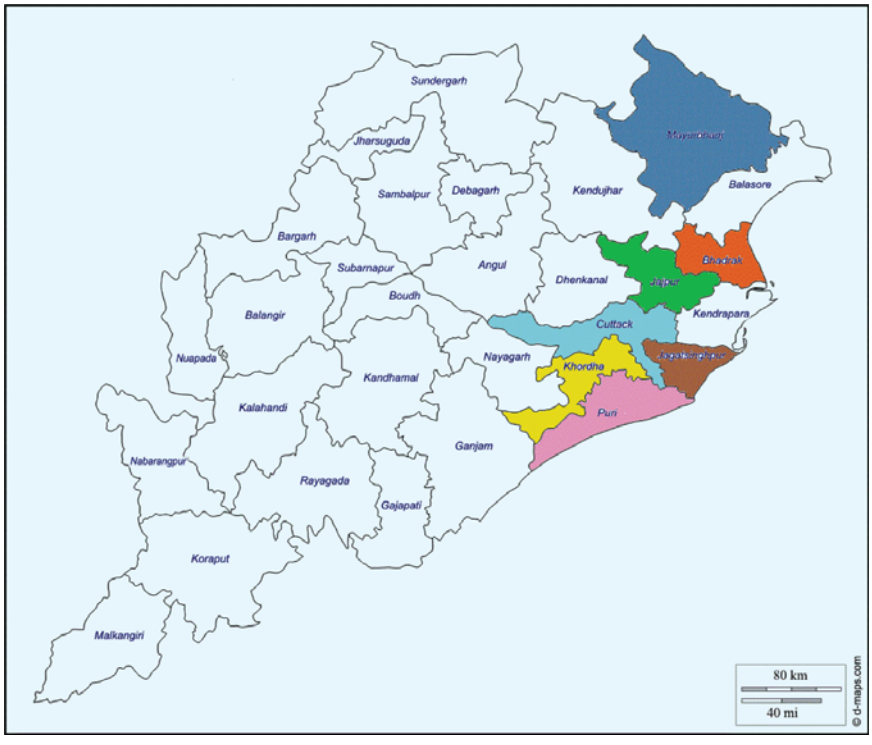


Fig.- 1. Map showing the study areas.

Table-1. Table depicting the district-wise selected endemic villages.

Sl no	District	Total CHC and Subcentres (SC)	SC with API>2 (Annual Parasite Index)	Proportion of SCs with API>2	Villages (taken for present study)
1	Cuttack	CHC - 17 SC-332	7	0.02	1. Kochilanugaon 2. Olaba 3. Godibandha 4. Debabhuin 5. Bhagua 6. Orda
2	Khurda	CHC 13 SC-202	2	0.0099	1. Niladriprasad 2. Kandulusahi 3. Badasula 4. Mendhasala 5. Gurujang 6. Khordagada
3	Puri	CHC- 11 SC-241	1	0.0041	1. Sanabandhakera 2. Aliaput 3. Rendhagarh 4. Jaipur 5. Mulaalasa
4	Bhadrak	CHC- 7 SC-178	1	0.0056	1. Baniagudi 2. Panipalashi 3. Sarpada 4. Ganijang 5. Pacchalo 6. Gundichasahi 7. Tarapur
5	Jagatsinghpur	CHC- 9 SC-189	1	0.0052	1. Mandasahi
6	Jajpur	CHC- 10 SC-250	4	0.016	1. Kandhaei 2. Talanagada 3. Majhinagada 4. Uparnagada
7	Mayurbhanj	CHC- 28 SC-589	40	0.06	1. Mundabani 2. Talabandha 3. Kadambadiha

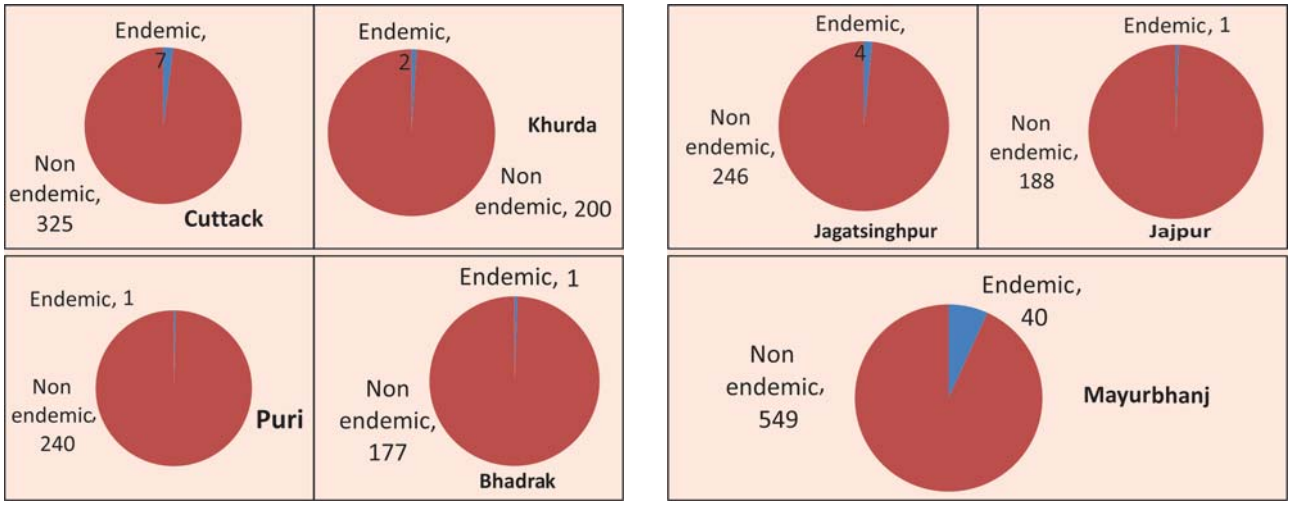
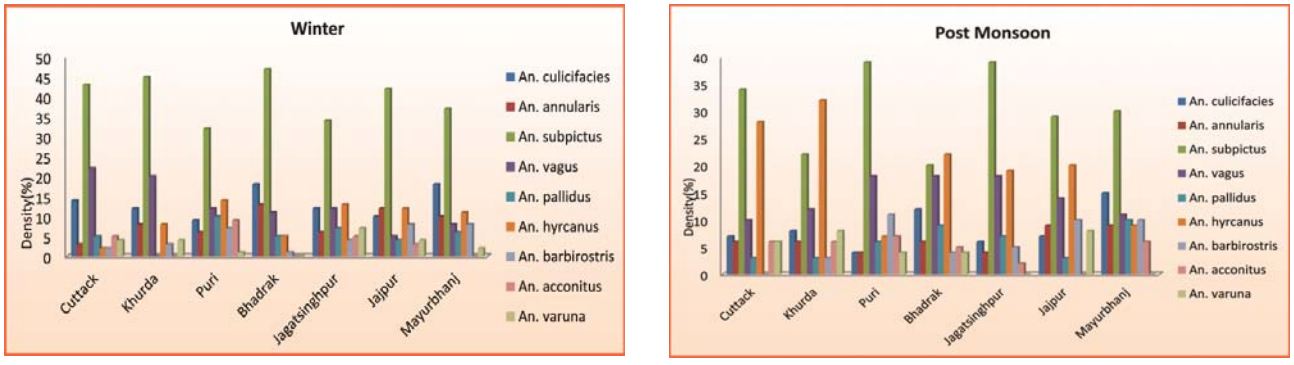


Fig.-2. Pie diagram showing district wise proportion of endemic/non endemic subcentres in seven coastal districts.

1. Seasonal prevalence of Anophleline vector species:



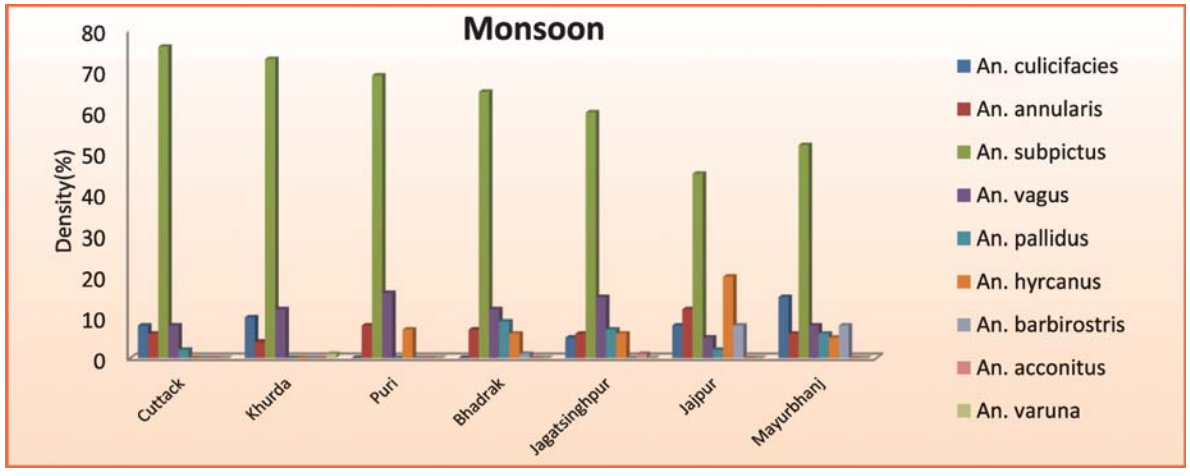


Fig.- 3. Season wise entomological profile in seven coastal districts.

An. subpictus was found to be predominant in almost all villages in coastal districts in monsoon, post monsoon as well as winter season. Apart from *An. subpictus, An. hyrcanus* was found in majority during monsoon and post monsoon period where as *An. vagus* during winter season. However, the primary vector, *An. culicifacies* was least observed in coastal Odisha.

1. **Larval density of *Anopheles* species in coastal districts:**

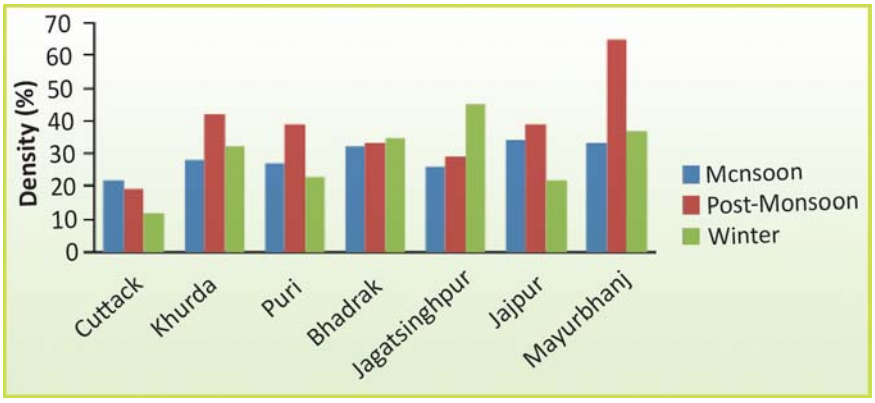


Fig.-4. Season and district-wise Larval density of *Anopheline* fauna.

3. Vector attributes study:

Although the primary vector, *An. culicifacies* was found to be quantitatively less, but there are still some endemic pockets in coastal area where active malaria transmission occurs. The annual sporozoite rate (*An. culicifacies*) was highest for Mayurbhanj district (infection rate = 1) followed by Cuttack (infection rate = 0.22) and Bhadrak (infection rate = 0.15). Similarly, Human Blood Index was found to be highest for Mayurbhanj (0.4) followed by Khurda (0.3) and Jajpur (0.25). In Mayurbhanj district, the sibling species study for *An. culicifacies* revealed that species B,C and E were prevalent in Mayurbhanj district where as B, C were found in other coastal districts.

4. Parity rate:

The parity rate of *An. culicifacies* was highest in Mayurbhanj district followed by Jagatsinghpur and Bhadrak

The insecticide susceptibility status for *An. culicifacies* showed that this species developed resistant to DDT and Cyfluthrine in some endemic zones of coastal districts viz. Mayurbhanj and Jagatsinghpur.

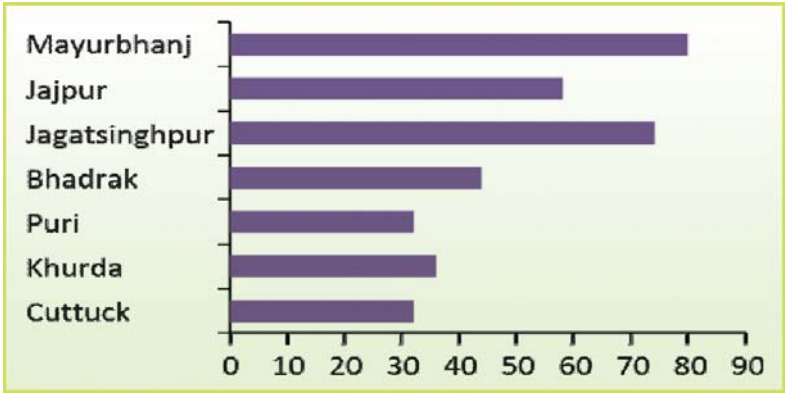


Fig.-4. District-wise parity rate of *An. culicifacies.*

Table.1 Insecticide susceptibility status of *An. culicifacies*.

District	Insecticide used	Mosquitoes exposed	Exposure time	Mortality	Mortality (%)	Susceptibility status
Cuttack	DDT 4%	30	24hrs	18	60	R
	OC-Control	10	24hrs	0	0	
	Cyfluthrin	30	24hrs	25	83.3	R
	PY-Control	10	24hrs	0	0	
Khurda	DDT 4%	30	24hrs	17	56.6	R
	OC-Control	10	24hrs	0	0	
	Cyfluthrin	30	24hrs	20	66.6	R
	PY-Control	10	24hrs	0	0	
Puri	DDT 4%	30	24hrs	18	60	R
	OC-Control	10	24hrs	0	0	
	Cyfluthrin	30	24hrs	21	70	R
	PY-Control	10	24hrs	0	0	
Bhadrak	DDT 4%	30	24hrs	15	50	R
	OC-Control	10	24hrs	0	0	
	Cyfluthrin	30	24hrs	19	63.3	R
	PY-Control	10	24hrs	0	0	
Jagatsinghpur	DDT 4%	30	24hrs	14	46.6	R
	OC-Control	10	24hrs	0	0	
	Cyfluthrin	30	24hrs	16	53.3	R
	PY-Control	10	24hrs	0	0	
Jajpur	DDT 4%	30	24hrs	18	60	R
	OC-Control	10	24hrs	0	0	
	Cyfluthrin	30	24hrs	22	73.3	R
	PY-Control	10	24hrs	0	0	
Mayurbhanj	DDT 4%	30	24hrs	12	40	R
	OC-Control	10	24hrs	0	0	
	Cyfluthrin	30	24hrs	15	50	R
	PY-Control	10	24hrs	0	0	

Discussion:

Based on the annual parasite index (API), API was found to be less than two in coastal districts of Odisha. In spite of various control strategies malaria continues to persist even in these districts. Hence proper monitoring of vector population and transmission dynamics during the peak transmission period can reduce burden of the disease. Besides this, there is also a need to periodically monitor and update the susceptibility status of malaria vectors for alternative vector control strategies and effective disease management.

13. Phase III evaluation of Deltamethrin 62.5 SC-PE long lasting indoor residual spraying against *An. fluviatilis* and *An. culicifacies*, the vectors of malaria, in Koraput and Kalahandi districts Odisha State.

Principal Investigator : Dr. R.K.Hazra, Scientist- E
Co-investigator : Dr. S. Pati, Director, Dr. N. Mahapatra, Sci.-F, Dr.M.M. Pradhan Joint Director, NVBDCP, Odisha
Starting Date : July 2018
Duration : 1 Year
Funding : EL (Bayer crops, Germany)

Introduction:

Due to fast development of resistance in malaria vectors worldwide, industries started manufacturing new vector control tools including insecticide mixtures containing at least two active ingredients with different modes of action as part of resistance management. One such newer vector control tool is Deltamethrin 62.5 polymer-enhanced suspension concentrate (SC-PE) (K-Othrine Polyzone, Bayer Crop Sciences, Germany) is an adjuvant aqueous suspension concentrate formulation containing 62.5 g of active ingredient per litre intended for extended residual activity on treated surfaces due to the addition of a specific polymer. The sixteenth working group of WHOPES (2013) reviewed the data generated from the small scale field studies on the efficacy of Deltamethrin 62.5 SC-PE for IRS against malaria vectors in the United Republic of Tanzania and South Africa, and WHOPES supervised small-scale (Vietnam) and large-scale trials (India and Mexico) and recommended that for quality assurance and determination of appropriate spray cycles under specific ecoepidemiologic settings, it is important to monitor the residual activity of Deltamethrin 62.5 SC-PE. Therefore, it is proposed to evaluate the efficacy of Deltamethrin 62.5 SC-PE in malaria endemic villages against *An. culicifacies* in Kalahandi district of Odisha State (Regional Medical Research Centre, Bhubaneswar) in India following the common protocol (ICMR, 2014).

Objectives:

- To assess the efficacy of Deltamethrin 62.5 SC-PE at 20 mg/m2 against *An. fluviatilis* and *An. culicifacies*.
- To determine the residual activity of Deltamethrin 62.5 SC-PE formulation and application intervals.
- To study the impact of Deltamethrin 62.5 SC-PE on disease incidence/ prevalence.
- To assess community acceptability of Deltamethrin 62.5 SC-PE.
- To document ease of application and handling of the insecticide product.
- To record perceived side-effects, if any, by spray men, insecticide handlers and inhabitants of the sprayed houses.

Summary of work progress:

Work done till the end of month December (2017):

The first field survey was conducted in Kalahandi district. On 18th and 19th July 2017, a comprehensive training programme on spray work was conducted in Kalahandi district by DMO and staff of DMO office.

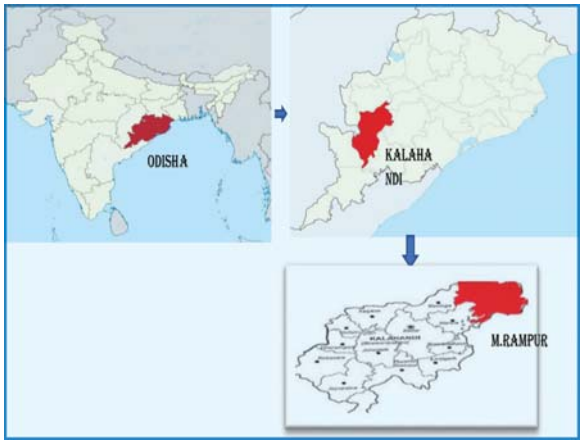
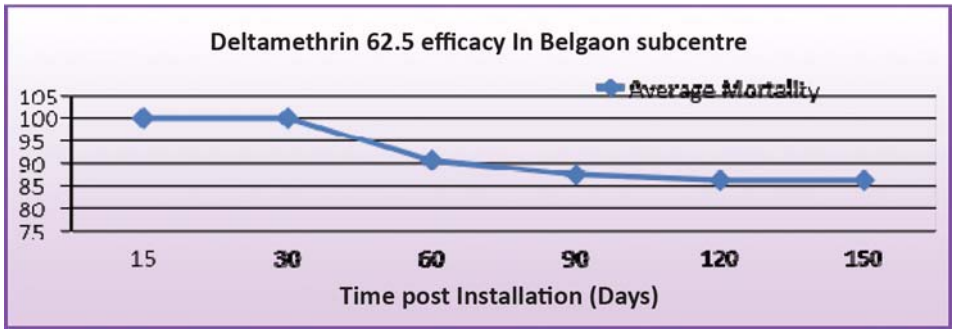


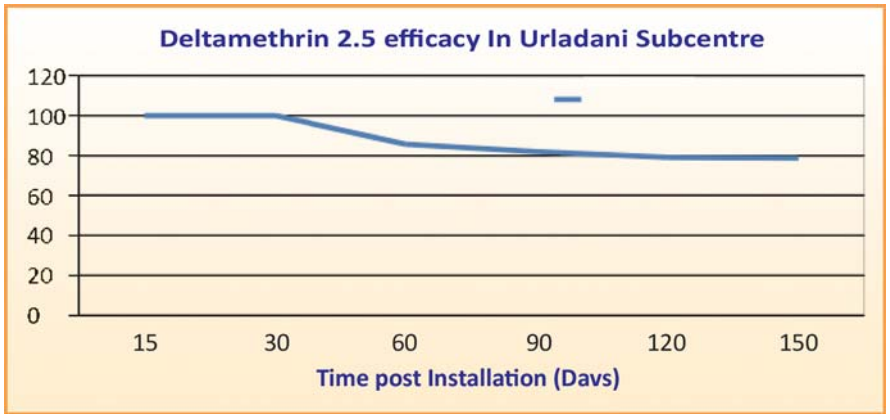
Fig:1 Map showing study area.

Deltamethrin 62.5(SC-PE) (Cone Bioassay):

Since *An. culicifacies* density was low after Deltamethrin 62.5 and 2.5 spray,the cone bioassay was conducted in the sprayed village (Subcentre: Belgaon, Urladani) on the above species collected from the nearest PHC i.e Biswanathpur.



Deltamethrin 2.5(SC-PE) (Cone Bioassay):



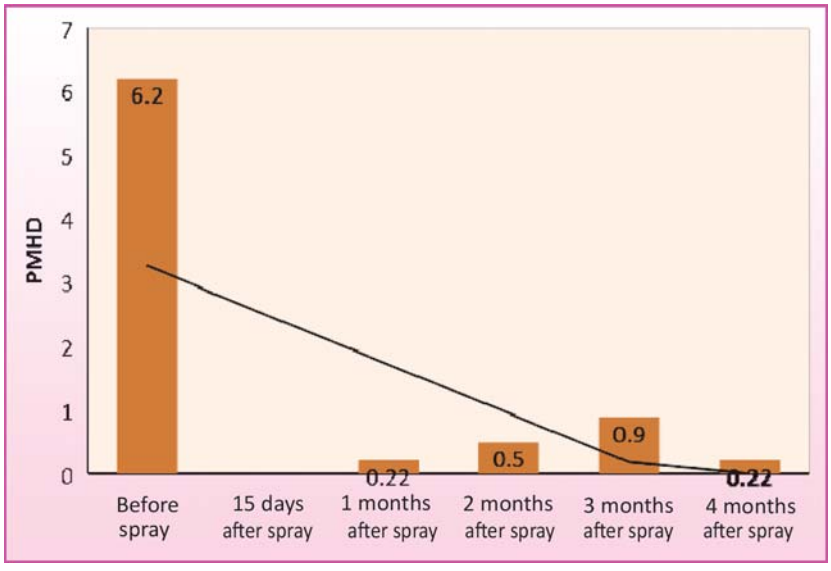


Fig 2: *An. culicifacies* density before and after spray at Belgaon (Deltamethrine 62.5)

A significant difference in *An. culicifacies* densities was observed before and after spray. Density which was found to be 6.2 PMH before a month of spray work, but after 15 days not a single *An. culicifacies* vector was observed indicating a high efficacy of Deltamethrin against *An. culicifacies*. However upto 4 months the density was found to be negligible.

Epidemiological profile:

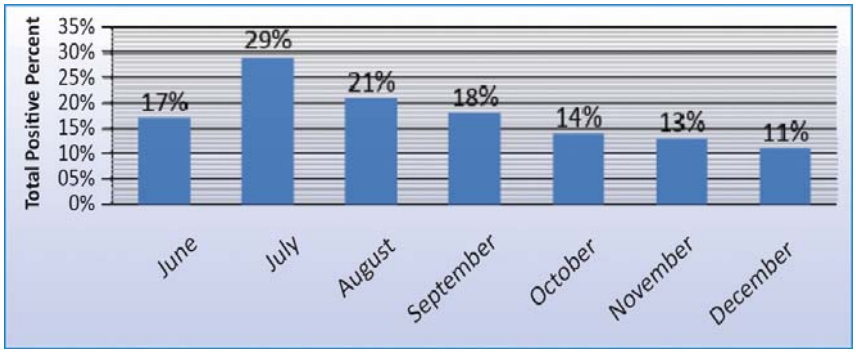


Fig 3 : Epidemiological profile of Belgaon subcentre (Deltamethrin 62.5)

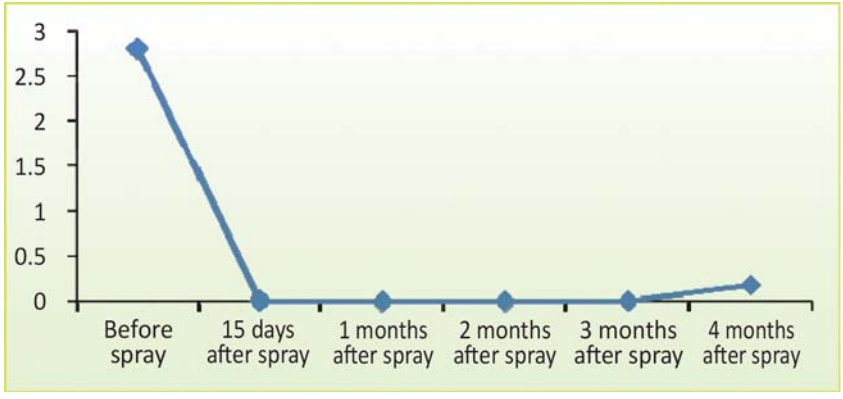


Fig 4: Sporozoite rate of major *Anopheles culicifacies* vectors in Kalahandi district.

We used a polymerase chain reaction (PCR)-based methodology to identify blood meal sources in engorged vector species as well as sporozoite rate.

Parity Status of *An. culicifacies*:

Sl No.	Month	No. Of Mosquito dissected	Nulliparous (%)	Parous (%)
1	June	20	35%	65%
2	July	20	25%	75%
3	August	Nil	-	-
4	September	Nil	-	-
5	October	20	70%	30%
6	November	20	65%	35%
7	December	20	65%	35%

Before spray the number of parous mosquito were found to be higher than nulliparous mosquito whereas after spray the percentage of nulliparous is increases.

Sibling Species Identification: Sibling species for *An. culicifacies* and *An. fluviatilis* were identified through AS- multiplex PCR (Allele specific) which is given in Table 16.

Table 30 : Sibling species identification for *An. culicifacies* in Kalahandi district.

Sl no.	CHC	June	July	August	September	October	November	December
1.	Urladani	A,B,C,D,E	Nil	Nil	A, D,E	A	E	D,E
2.	Belgaon	A,B,C,D,E	Nil	Nil	B,E	B,C,E	C,E	C,

The present study evaluated the efficacy of Deltamethrin towards malaria control in Kalahandi district. This formulation and dosage are highly toxic to *An. culicifacies* and some other vectors and require only a single treatment per year. The killing effect is faster and lasts longer. Besides decrease in sporozoite rate in *An. culicifacies,* there was also drastic decrease in epidemiological profile of malaria.

14. Determinants of high MDR TB in Sikkim and its control: a multi-centric study.

Principal Investigator : Dr D. Das, Scientist-E
(NIRT Site) : Dr K. R Umadevi, Sc-E, NIRT, Chennai
Collaborator : STO, RNTCP, Sikkim
Funding : ICMR Intramural

Background

The study was initiated in the State of Sikkim with the help of STO and RNTCP Sikkim staff. The patients were contacted by Senior Treatment Supervisor and visited by Principal Investigator, DTO and other RNTCP staff. Patients were interviewed at their residence following a structured questionnaire, which was translated to their local language by RNTCP staff. A total of 50 TB and DR TB patients were interviewed from East and South districts of Sikkim.

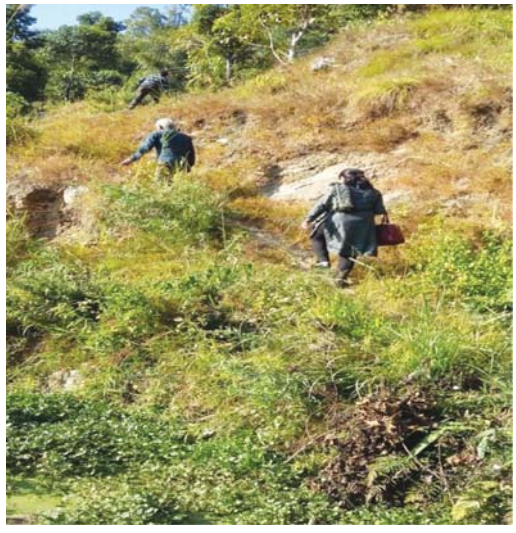


Fig. Visit of PI and DTO, South Sikkim to the MDR TB patient's house.

Table: Characteristics of TB patients interviewed in the state of Sikkim (N=50)

Sl. No.	Attributes	Characteristics
1	Gender	60% Males
2	Age group	<14yrs =4%, 15-29yrs=68%, 30-44yrs =8%, 45-59yrs=14, 60yrs=6%
3	Ethnicity	Nepali=72%, Lepcha=4%, Bhutia=6%, Others= 18%
4	Educational status	Illiterate-18%,Primary 34%, High school 38%, Degree10%
5	Habitation	38% Rural
6	Housing	32% Katcha house
7	Use of Fuel for Cooking	Gas=84%, Kerosene=4%, Wood=10%
8	Past history of smoking	30%
9	Past history of alcohol use	20%
10	BCG vaccination	54%
11	Diabetic	4%
12	Lived with TB patient in the family	42%
13	Visited Govt. hospital at start of symptom	64%
14	Visited any health facility or consulted any health personnel after 2 weeks of onset of symptoms	20%

15. National Reference Laboratory for Tuberculosis.

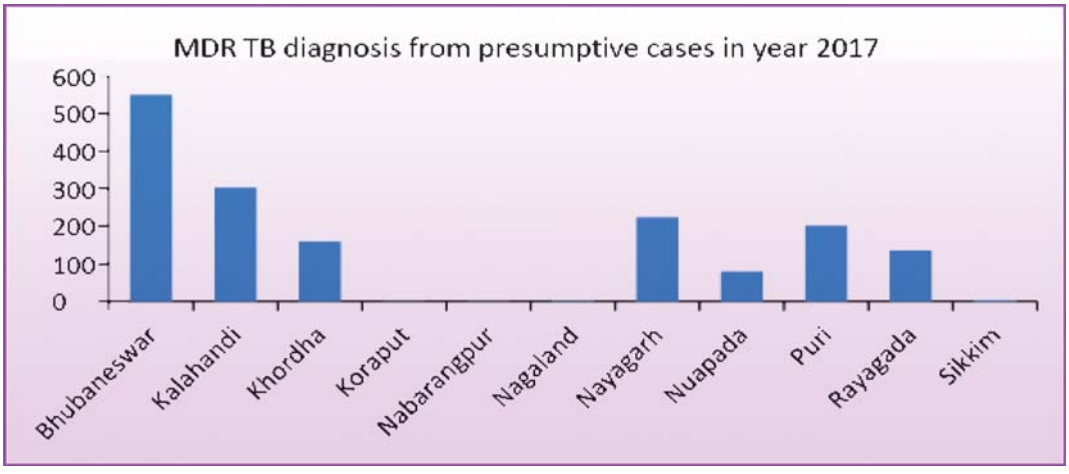
Principal Investigator : Dr Dasarathi Das, Scientist-E
Starting Date : October 2013
Funding : Central TB Division

Background

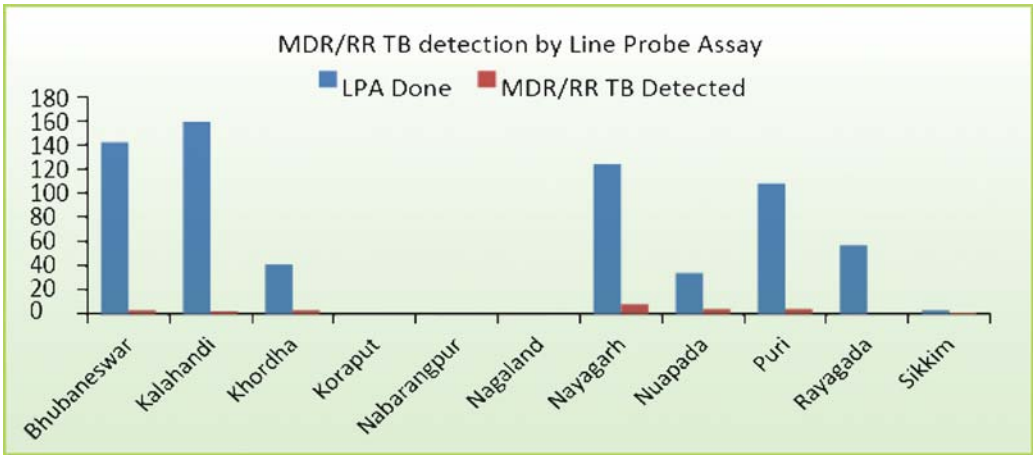
RMRC, Bhubaneswar is one of the six National Reference Laboratories (NRLs) of the country which supervises 10 states like Odisha, West Bengal and 8 North East states for quality TB diagnosis by RNTCP. The main focus of the activities is quality assessment of laboratories providing TB diagnosis by smear microscopy, culture and genotypic methods like LPA and CB NAAT. In addition to quality diagnosis, NRL provides training to laboratory personnel working in state IRL and C & DST laboratories and technical support for establishment of new RNCTP laboratories. It also provides diagnosis and follow up culture for MDR TB patients on DOTS Plus regimen to 10 districts of Odisha (Bhubaneswar, Puri, Nayagarh, Khordha, Rayagada, Kalahandi, Malkangiri, Kopraput, Nuapada &, Nawarnagpur) and TB diagnosis based on smear microscopy, culture and CB NAAT through its Designated Microscopy Centre operating at OPD of RMRC, Bhubaneswar. NRL also provides follow up culture services to Sikkim and Nagaland states. Second line DST by Liquid culture is being done for the follow up positive culture samples and MDR samples.

Progress

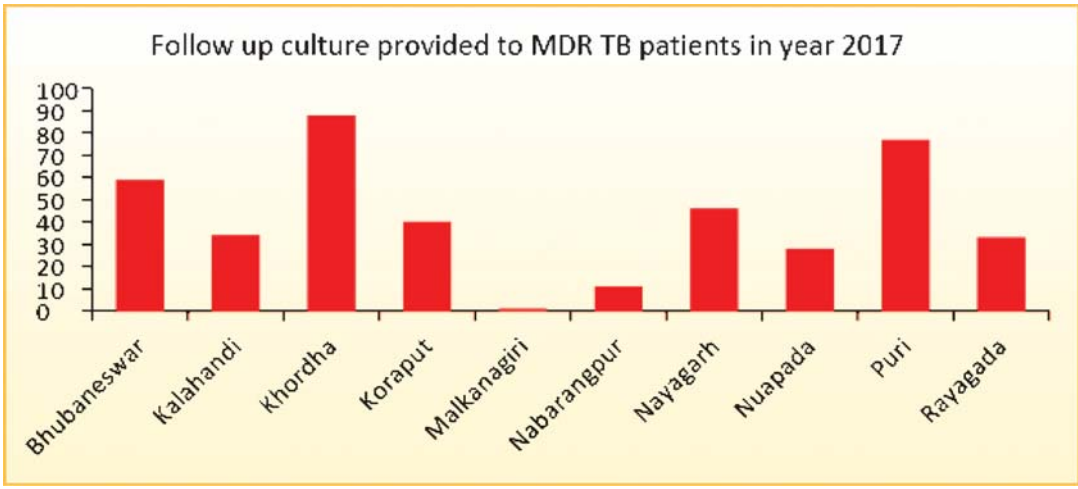
During this period the center carried out proficiency testing for IRL-Guwahati, NBMC-Silliguri, IRL-Arunachal Pradesh and IRL-Sikkim. This year NRL become proficient in 1st line LC-CDST and 2nd line DST by LPA in addition to proficiency in 1st line LPA, 1st and 2nd line DST in solid Lowenstein-Jensen medium. During this period external quality assessment visits were made to nine states (West Bengal, Odisha, Arunachal Pradesh, Assam, Mizoram, Tripura, Meghalaya, Manipur and Nagaland). One of the Consultant Microbiologist was trained in 2nd line LPA at NTI, Bangalore. The trained consultant Microbiologist provided 2nd line LPA training at IRL-Cuttack, IRL-Kolkata, IRL-Guwahati, NBMC-Siliguri and NRL-Bhubaneswar. NRL in charge and one in-charge consultant microbiologist attended NABL Internal Auditors and QMS Training in Delhi and lab has submitted NABL application form. Third party evaluation of Tuberculosis Laboratory Diagnostic Network under RNTCP supported by USAID was carried out in the laboratory on 1st Nov, 2017.



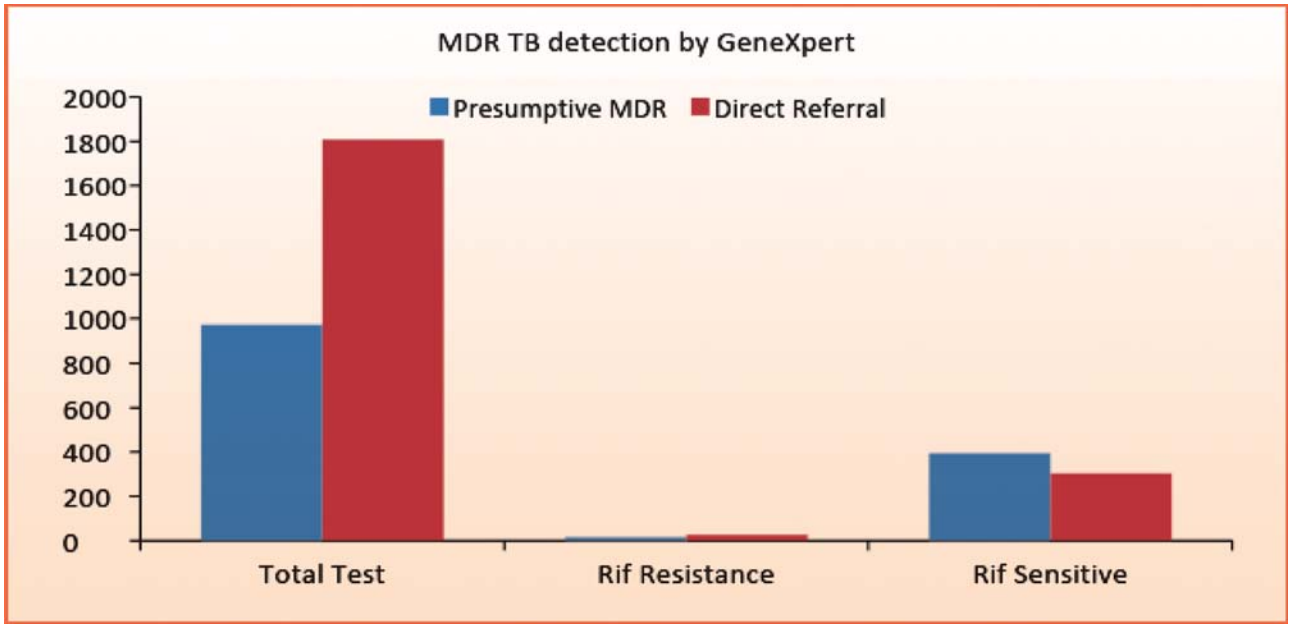
During the year 2017, a total of 1681 presumptive MDR TB cases were tested for diagnosis of MDR TB from ten districts of Odisha.



Out of 1681 specimens received at NRL, RMRC, 668 smear positive specimens were tested by LPA and 3.74% were detected as MDR TB patient and referred to DR TB sites for DOTS Plus treatment.



In 2017, a total of 452 specimens of MDR-TB patients on DOTS Plus treatment were processed for follow up culture. Out of which, 32 patients were found as XDR suspects and sent for 2nd line DST. to NTI, Bangalore.



In 2017, a total of 2782 samples were tested by GeneXpert, out of which 26.5% were found as MTB positive. Among the MTB positives 5.4% specimens were resulted as Rifampicin resistance, which were referred to districts for DOTS Plus treatment initiation.

Designated Microscopy Centre and DOTS site

The centre has opened a DMC in its OPD for diagnosis of suspected TB patients with pulmonary and extra pulmonary symptoms for Bhubaneswar city. In 2017, TB diagnosis was provided to 454 suspected TB patients, out of which 55 were AFB positive and from 97 follow up patients on DOTS 16 were found to be AFB positive.

16. Enhancing biorisk mitigation awareness in public health community and creating laboratory networks for enhanced diagnostic capabilities to deal with surveillance and outbreaks of high-risk group viral pathogens causing viral hemorrhagic fevers and respiratory infections.

Principal Investigator : Dr. B. Dwibedi, Scientist-E
Starting date : September, 2015
Duration : 3years
Funding : EMCDC

Background:

Viral hemorrhagic fever (VHF) refers to a variety of viral diseases, which are characterized by fever and bleeding in humans. Most of the VHF diseases are caused by RNA viruses belonging to the families; *Filoviridae*, *Arenaviridae*, *Bunyaviridae*, and *Flaviviridae*. These viruses cause an acute infection and there is no evidence of chronic courses.

It was aimed at creating regional facilities to be involved in laboratory diagnosis, surveillance and research in viral hemorrhagic fever coordinated by NIV, Pune.

The proposal is to create infrastructures for timely identification of highly infectious viruses causing significant mortality & morbidity at public health level and specific agents causing epidemics and/ or potential agents for bioterrorism. Outbreak investigation, surveillance during epidemic and inter epidemic period and sporadic disease diagnosis of important viral diseases of the region and emerging infections would be carried out which will be strengthened by research subsequently.

Objectives

- **Component-1:** Increasing awareness as well as conducting various levels of teaching and training programs on Biorisk management and engineering controls required for safely operating biomedical laboratories and infection control practices in the public health settings.
- **Component-2:** Creating laboratory network for enhancing diagnostic capabilities for surveillance, outbreaks and epidemics investigations of high-risk group of viral pathogens causing viral hemorrhagic Fevers.
- **Component-3:** Creating laboratory network for enhancing diagnostic capabilities for surveillance, outbreaks and epidemics investigations of high-risk group of viral pathogens causing respiratory infections.

Progress of work

I. Networking for information, Sample receipt, Investigation and reporting

Network has been established with the State Health Department, Medical Colleges and Hospitals of the region for referral investigation of sporadic cases and outbreak investigation. Outbreak investigations are being undertaken along with the state health team upon getting information through media or health system. Immediate report is being communicated to the concerned hospital within 3 days of sample receipt.

II. Sample collection

Diagnostic services have been provided to 188 patients till date covering more than 5 viruses (Dengue, Chikungunya, ZIKA are tested in RMRC, Bhubaneswar and other viruses i.e. CCHF and KFD are tested in NIV, Pune) important for public health which cause viral hemorrhagic fever. Since Jan, 2017 the centre received 730 samples from 10 different hospitals and outbreak investigations from various districts of Odisha. Testings were done through ELISA Method (Dengue IgM and NS1 Ag, Chikungunya IgM) and by RT-PCR (Trioplex CDC-NIV for Dengue, Chikungunya and Zika Virus). Network has been strengthened from State Health Department to District Health level for getting immediate out break information and investigating the outbreaks within 24 hours.

III. Investigation on sporadic/ referred cases

Sporadic/referral cases were received by the centre from different hospitals of different districts. The major diseases investigated are summarized below:

Dengue fever (DF) is of great public health importance. Currently, an estimated 2.5 billion people in more than 100 countries are at risk. Southeast Asian countries bear a high burden of DF and experience frequent and cyclical epidemics. Surveillance for DF is passive, with only severe cases reported to the World Health Organization by most countries. Rapid changing epidemiology of DF in Southeast Asia region is the challenge that needs to be addressed in designing operational research and implementation strategies. Dengue is already covered by NVBDCP network and established a monitoring of dengue cases. But dengue negative samples need attention for screening for other VHFs like CCHF and KFD. The following symptoms are present in case of Dengue hemorrhagic fever,

1. Fever or acute fever lasting for 2-7 days, occasionally biphasic.
2. Haemorrhagic tendencies like bleeding from mucosa, GI tract.
3. Thrombocytopenia (less than 10^5 cells/mm^3)

Chikungunya fever (CF) is of great public health importance. Currently, South-East Asia countries have been severely affected by the outbreaks of Chikungunya fever. The following symptoms are must be present in case of Chikungunya hemorrhagic fever,

1. Fever or acute fever > 38.5°C.
2. Headache, Jointpain.

Crimean Congo Hemorrhagic Fever (CCHF) is another dreadful VHF disease and concern for India. CCHF outbreak constitutes a threat to public health because of its epidemic potential, high case fatality, potential for nosocomial outbreaks, and difficulties in treatment and prevention. The mortality rate from CCHF is approximately 30% among hospitalized patients (range 5-50%).

This virus can be transmitted mainly through direct contact with blood or tissues from infected livestock or through bites of *Hyalomma* species of ticks. This has shown its presence by human outbreaks in four states (Gujarat, Rajasthan, Himachal Pradesh and Uttar Pradesh), where as presence of anti CCHF antibodies in domestic animals have been recorded countrywide in 23 states in India. This emphasized the need to surveillance of CCHF in country. The following symptoms are present in cases of Crimean Congo Hemorrhagic Fever,

1. Headache, high fever, back pain, joint pain, stomach pain and vomiting.
2. Red eyes, flushed face, red spots on the palate are common.

Kyasanur Forest Disease (KFD) was first recognized in 1956 in India. It was shown to be endemic in five districts (Shimoga, Chikmagalur, Uttara Kannada, Dakshina Kannada and Udupi) of Malnad region of Karnataka State. In nature it is maintained in ticks, mammals and birds. It causes severe febrile illness in humans and associated with a high number of deaths among monkeys in Kyasanur Forest, Karnataka State. The natural cycle of KFDV involves two species of monkeys' viz. *Presbytis entellus* and the *Macaca radiata* and various tick species belonging to genus *Haemaphysalis*. The following symptoms are present in cases of Kyasanur Forest Disease,

1. Acute fever, headache, myalgia.
2. History of exposure to ticks and visit to forest area, particularly forest in Karnataka.

Zika Viral Disease

Zika viral disease is an emerging viral disease

transmitted through the bite of an infected Aedes mosquito. This virus was first identified in Uganda in 1947. Outbreaks of Zika virus disease have been recorded in Africa, America, Asia and Pacific. The following symptoms are present in cases of Zika virus disease,

1. Fever, skin rashes, conjunctivitis, muscle and joint pain, malaise and headache.
2. Symptoms are usually mild and last for 2-7 days.

Future Plan

The above activities will continue for the next year. More emphasis will give on creating multi skill paramedical and health professionals to deal with viral disease surveillance and timely investigation/ management of outbreaks. Periodically training will be provided to the technical and supportive paramedical staff for laboratory diagnosis of some of the important diseases of public health concern which will support state public health system.

Outbreak investigation will continue along with sporadic case investigation with collaboration of state hospitals.

17. A multi-centric study to estimate the sero-prevalence of dengue, Chikungunya and JE virus infection in India.

Principal Investigator : Dr. B. Dwibedi, Scientist – E
Co-Investigator(s) : Dr. Prakash K. Sahoo, Sci-E
Date of Start : 16th October 2017
Duration : 6 months
Starting Date : October 2013
Funding : ICMR, New Delhi

Objectives:

- **Primary objective**: To estimate the age-specific sero-prevalence of dengue virus infection in India.

Table 1. Laboratory Report of test cases and its outcome.

Center - Bhubaneswar		Duration/Period - January - December'17									
		Dengue		Chik		Zika		CCHF		KFD	
S.No.	Month	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive
1	Jan-17	13	3	13	1	13	0	39	0	39	0
2	Feb-17	11	2	4	1	3	0				
3	Mar-17	39	2	8	1	23	0				
4	Apr-17	44	0	12	2	17	0	13	0	13	0
5	May-17	59	2	2	0	0	0				
6	June-17	24	5	9	2	9	0				
7	July-17	38	11	38	5	26	0	94	0	94	0
8	Aug-17	78	24	31	11	81	0				
9	Sept-17	62	28	13	2	0	0				
10	Oct-17	69	22	35	13	0	0	323	0	323	0
11	Nov-17	157	36	102	14	17	0				
12	Dec-17	97	11	31	6	32	0				
Total		**691**	**146**	**298**	**58**	**221**	**0**	**146**	**0**	**146**	**0**

- **Secondary objective:** To estimate the sero-prevalence of Chikungunya & Japanese Encephalitis Virus in India.

Background:

Dengue is a major public health problem in India. Outbreaks of dengue fever are reported from both urban as well as rural areas. Several dengue vaccine candidates are in development. A live attenuated dengue vaccine, developed by Sanofi Pasteur has now been licensed in several dengue-endemic countries in Asia and Latin America for use among persons aged 9-45 or 9-60 years. Since the vaccine boosts naturally acquired immunity, WHO recommends introduction of the vaccine only in geographic settings with high endemicity, as indicated by sero-prevalence of approximately 70% or greater, in the age group targeted for vaccination. Information about endemicity of dengue virus infection is therefore necessary for policy makers to decide if the introduction of the vaccine would have public health impact as well the target age for dengue vaccination. In absence of any data about endemicity of dengue infection in the country, a multi-centric project was conducted for sero-survey to estimate the age-specific prevalence in India.

Besides Chikungunya & JE infection are also quite important from public health point of view as both vectors and susceptible host are creating a favorable environment for disease development.

Work plan:

The geographic regions of the country were divided in five regions. In each geographic region, three states were selected randomly. In our states, four districts were selected by probability proportional to size (population) linear systematic sampling (PPSLSS) method. These districts are Nayagarh, Bhadrak, Subarnapur and Sambalpur. From each selected district, two clusters from urban and 2 clusters from rural areas were selected by PPSLSS. In the selected cluster, the survey was conducted targeting 25 individuals in each three age-groups (5-8 y, 9-17y and 18-45y). In the selected villages after a short awareness programme by the investigating team, subject enrollment was planned on a suitable date in consultation with District Health department.

After sample collection the sample was transported to nearby PHC/CHC. The sample centrifuged at 3000 rpm on same day. Then the separated serum divided into three parts as ELISA, QC and one sample kept for RMRC, Bhubaneswar. Likewise, all the 16 clusters are completed. The sample stored as Group A, B and C individually with cryolabels, at -80° C.

Blood samples from these individuals were sent to coordinating centre (NIE, Chennai) for estimating dengue IgG antibodies using commercial ELISA kit. The data will be analyzed to estimate the age specific. With support from the village level Health staff, the project team under took HH census, village mapping after which the study individuals randomized through central server at NIE.

Then in the selected population clinical and epidemiological information were collected and blood sample were drawn with written consent from the study individuals or parents. The coverage of study population in each of the identified village is given in the following table.

The total of 324 individuals were enrolled covering from Age group from 5-8 yrs,331 individuals from age group 9-17 yrs and 287 individuals were enrolled from age group 18-45 yrs. However, individual questionnaires were fielding from 75 individuals from each village. As per protocol the sample were divided with aliquot and transport to NIE lab maintaining cold chain for centralized lab investigation.

The dengue sero-survey study report of entire 16 clusters is attached with total number of samples, groups individually in a tabular form.

Village	Urban/Rural	Districts	Age Group A	Age Group B	Age Group C	Total Sample
Kurmloikela	Rural	Sambalpur	23	18	17	58
Sardhapur	Rural	Sambalpur	22	23	22	67
Hirakud	Urban	Sambalpur	25	24	24	73
Sambalpur	Urban	Sambalpur	21	23	23	67
Madhiali	Rural	Bhadrak	16	20	15	51
Binataro	Rural	Bhadrak	20	19	17	56
Bhadrak	Urban	Bhadrak	18	13	18	49
Basudevpur	Urban	Bhadrak	16	17	13	46
Barakoli	Rural	Nayagarh	22	18	16	56
Badhulipur	Rural	Nayagarh	22	25	21	68
Khandapada	Urban	Nayagarh	19	20	15	54
Itamati	Urban	Nayagarh	17	23	13	53
Pandakital	Rural	Subarnapur	21	25	15	61
Sangrampur	Rural	Subarnapur	23	22	22	67
Binika	Urban	Subarnapur	24	22	21	67
Sonapur	Urban	Subarnapur	15	19	15	49

18. Study of Japanese Encephalitis Virus (JEV) Infection Associated Acute Encephalitis in Malkangiri District: Pre & Post Vaccination Period.

Principal Investigator : Dr. B. Dwibedi, Scientist-E
Starting date : March 2017
Duration : 3 years
Funding : ICMR- Extramural

Objectives:

Primary:

- To undertake surveillance for Acute Encephalitis Syndrome (AES) by establishing a network with district health system and Viral Research and Diagnostic Laboratory (VRDL) of RMRC, Bhubaneswar.
- To study the viral aetiology of AES cases and associated co-morbidity/ co-infection.

Secondary:

- To evaluate the JE vaccination coverage through immunization record review and sample survey.

Background:

In Odisha AES cases due to JEV have been confirmed in outbreaks from tribal dominated districts like Malkangiri, Keonjhar, Mayurbhanj and other districts like Jajpur & Puri causing high mortality in

children. JE has also been reported in sporadic form from around 10 out of 30 districts of the state covering both coastal and tribal areas. This reflects a higher population at risk of JEV infection and related mortality. Recently in 2016 (Sept – Nov) large no. of cases with high mortality in Malkangiri raised public health concern. Though investigation indicated JEV infection, aetiology was not confirmed in all the cases. Mean while JEV vaccination has been introduced in children between 1-15 yrs in 4 districts including Malkangiri. Hence, this study intends to undertake surveillance for AES cases in context of JEV vaccination and provide support to this emerging health problem. Through retrospective and prospective surveillance AES cases will be enumerated and viral aetiology will be investigated. A systematic network with district health system will be established for enrollment and investigation of AES cases admitted to CHCs/ district hospital of Malkangiri. VRDL RMRC will ensure timely investigation and reporting to the health system. JEV vaccination coverage will also be evaluated and will be analyzed with JEV associated AES in the district before and after introduction of immunization programme.

Progress

As per the study plan, we have undertaken case enumeration and clinical information an analysis of the JE suspect cases/ AES cases reported in the district of Malkangiri during 2016-17.

Cases of 336 were identified as cases of Acute Encephalitis Syndrome reported during 2016-17 following NVBDCP case definition. Out of all the above febrile cases, 95 and 73 children were reported with significant change in mental status and seizure respectively. Laboratory conformation for JE IgM was recorded in 146 cases, out of which death was recorded in 34 cases. Line listing of all JE positive cases was made. Out of the seven CHCs reported with AES cases during 2016-17, 4 CHCs named Mathili, Kalimela, Podia & Korkunda covering 13 villages were visited to follow up the recovered cases for development of sequele, if any. Follow up for available AES cases (lab confirmed or clinical) were done but no disease sequele was noted in the children who were present during the follow up (n=95).

For undertaking the immunization coverage survey, village listing of all the CHC areas have been done and study villages have been randomly selected for the purpose. Sensitization meeting has been conducted in the presence of Director of Health Services and District Health Officials for screening of all suspected cases at the village level and referral to the district hospital. Sensitization of all the PHC/ CHC in-charges was made at district level monthly meeting for coordinating their respective areas for optimal case screening. During 2017 (Oct-Nov), 2 cases of ICU admission with fever and altered sensorium were investigated. One case (7-month, female) was found to be JE IgM positive from the blood samples. However, there was no case of AES reported from the district during 2018.

19. Virology Network Laboratory at RMRC, Bhubaneswar.

Principal Investigator : Dr. B. Dwibedi, Scientist-E
Co-Investigators : Dr. R. K. Hazra, Mrs. S. Dixit
Starting date : March, 2010
Duration : 8 Years
Funding : Extramural (ICMR)

Background

It was aimed at creating regional facilities to be involved in laboratory diagnosis, surveillance, outbreak investigation and research in viral diseases of importance.

The proposal involves construction of the laboratory, procurement of equipments, training of involved staff, establishment of laboratory techniques like serology, molecular diagnosis, sequence analysis,

cell culture and isolation etc. in phased manner. Outbreak investigation, surveillance during epidemic and inter epidemic period and sporadic disease diagnosis of important viral diseases of the region and emerging infections would be carried out which will be strengthened by research subsequently.

Objectives

To establish a grade I diagnostic virology laboratory for investigation of viral diseases of regional and national importance including but not limited to

- **Viruses transmitted by respiratory route**: Measles, Rubella, Mumps, Influenza viruses (A, B and C), Parainfluenza virus, Adenoviruses, Respiratory Syncytial Virus, Rhinoviruses, Coronaviruses.
- **Viruses transmitted by intestinal route**: Poliovirus, Hepatitis A & E viruses, Rotavirus, Astroviruses, Calciviruses, Norwalk viruses, Enteroviruses.
- **Vector Borne Disease Viruses**: Dengue, Chikungunya, Japanese encephalitis, West Nile, Kyasanur Forest Disease, Chandipura, Zika viruses.
- **Zoonotic viruses**: Rabies virus, Nipah virus, Hanta virus
- **Viruses transmitted by body fluids**: HIV, Hepatitis B and C viruses.

Progress

I. Networking for information, Sample receipt, Investigation and reporting

Network has been established with the State Health Department, Medical Colleges and Hospitals of the region for referral investigation of sporadic cases and outbreak investigation. Outbreak investigations are being undertaken along with the state health team upon getting information through media or health system. Immediate report is being communicated to the concerned hospital within 3 days of sample receipt.

II. Sample collection

The centre is continuing surveillance and outbreak investigation of important viral diseases in the region through the established Grade-I viral lab as a part of network of viral research and diagnostic laboratories in India. Diagnostic services have been provided to >36000 patients till date covering more than 50 viruses important for public health. Since Jan, 2017 the centre received around 5824 samples from 40 different hospitals, 6 medical colleges and outbreak investigations from various districts of Odisha. Network has been strengthened from State Health Department to District Health level for getting immediate out break information and investigating the outbreaks within 24 hours. The viruses investigated were HSV I, HSV II, JE Virus, Dengue, CHIK, Rota, Astro, Adeno(Enteric), Noro G1, Noro G2, Coxsackie, Measles, Varicella, Mumps, Rubella, Entero HAV, HEV, HBV, HCV, HDV, HPV, EBV, CMV, Adeno, Influenza A (FluA), FluA (H1N1), Flu B, HMPV A/B, Rhino, Para influenza 1, Para influenza 2, Para influenza 3, Para influenza 4, RSV A/B, Corona viruses(Cor63,Cor229,Cor43, HKU1), Parecho virus, Boca Virus(HBoV), EV and Zika.

Investigation on sporadic/ referred cases

Sporadic/referral cases were received by the centre from different hospitals of different districts. During 2017, 5417 numbers of samples were received by the lab from different Govt. and Private hospitals of Odisha. The major diseases investigated are summarized below:

Enteric viruses

Among enteric viruses Rota antigen was detected in 22% (n=144) of cases. Genotype G1 (25.3%), G2 (13.3%), G3 (30.6%) G8 (5.3%) and G12 (6.6%) and P4 (21.3%), P6 (1%) P8 (33.3%) and were detected as major

genotypes. G3P8 was the most common combination found in 15% of antigen positive cases. Hepatitis A Virus was detected in 36.4% (n=228) and Hepatitis E Virus was detected in 13% (n=228) of cases with acute hepatitis.

Hepatitis Viruses

Among the cases of jaundice screened for hepatitis virus infection, HBV (n=258) and HCV (n=245) were detected serologically in 10.4% and 17% respectively and genotyping was done in positive cases where the major was HBV genotype D along with A and C and HCV genotype 1b were identified as the genotypes circulating in this region.

Respiratory Viruses

Viral respiratory infection was another important disease which was covered for laboratory diagnosis. Through Real Time PCR assay, a total of 123 cases were investigated for respiratory viruses like, Influenza A (FluA), FluA (H1N1), Flu B, HMPV A/B, Rhino, Para influenza 1, Para influenza 2, Para influenza 3, Para influenza 4, RSV A/B, Corona viruses (Cor63, Cor229, Cor43, HKU1), Parecho virus, Boca Virus (HBoV) and EV analyzed out of which 14 were found positive for viral etiology. The viruses detected were Para influenza, HMPV, Adeno, RSV and HPeV.

Pandemic H1N1 2009

During 2017 cases with suspected influenza were referred to the centre from almost all districts of the state for laboratory diagnosis of H1N1. Out of 1703 samples tested, Flu A and H1N1 was detected in 38.2 and 24 % respectively.

Air borne Viral Diseases

Among air borne diseases Measles IgM was detected in 49% (n=120) of the cases and the circulating genotype was identified as D8. Varicella IgM was detected in 21.4% (n=28) of cases. Rubella IgG (n=719) was detected in 61% of cases where as Rubella IgM was detected in 3.7% (n=134) of cases. Mumps IgM was detected in 8 cases out of 12 samples tested.

Encephalitis

Neurotropic viruses causing acute encephalitis admitted to different hospitals were investigated and clinical manifestations described. HSV, Measles, Dengue and Varicella Zoster Virus were seen as the major causes of viral AES either as single or co-infection. Viruses that cause encephalitis were also investigated in a total of 1363 cases and Herpes simplex virus I was detected in 11%(n=466), Herpes Virus II in 7%(n=466) and Japanese Encephalitis was detected in 8%(n=1035) of cases. Other encephalitis causing viruses detected in low prevalence were Entero virus, Dengue, Measles and Mumps.

Zika

A total of 223 cases have been screened by PCR and RTPCR for Zika Virus and none has been found positive till date.

Outbreak investigations

Outbreaks were reported from different parts of the state and investigation was done in collaboration with the state health department. The team collected the samples both by direct investigation and through collection by the primary health centre/district hospital of the concerned area. During this period outbreak of Measles, Varicella, Hepatitis, Dengue, Chikungunya, AES including JE infection has been investigated with immediate reporting to State Health Department along with recommendations for timely prevention. During 2017, 30 outbreaks were investigated along with State Health Departments covering 13 districts of Odisha and 407 samples were collected/referred for laboratory investigation.

The major outbreaks investigated during 2017 are summarized below:

Jaundice Outbreak Investigation

1. Investigation in Tulasipur, Cuttack district

During third week of January, 2017 a total of 82 numbers of blood samples were investigated for suspected Hepatitis outbreak in Mathasahi, Tulasipur, Cuttack district. Blood (n=82) were subjected to laboratory test. Antibody for HEV was detected in 40 samples and HAV antibody was not detected.

Also, 7 no. of blood samples were referred for laboratory investigation for suspected jaundice outbreak in Mundasahi, Bhubaneswar, of Khurda district. Antibody for HEV was detected in 1 sample and HAV antibody was detected in 3 samples out of 7 samples subjected to laboratory investigation.

2. Investigation in Bhawanipatna, Kalahandi district

Jaundice outbreak was investigated during 1st and 3rd week of April in Bhawanipatna, Kalahandi. A total of 85 numbers of suspected blood samples were investigated in collaboration with the CDMO. Antibody for HEV was detected in 56 out of 85 samples and HAV antibody was not detected in any of the samples. The result of laboratory investigation along with recommendation was communicated to the health authorities.

3. Investigation in Khurda district

During the month of April and June, jaundince outbreak was investigated in Purusottam Basti, Bhubaneswar in collaboration with District Surveillance Officials. A total of 20 blood samples were tested for HAV and HEV IgM and 10 samples were positive for HEV IgM and 2 samples were positive for HAV IgM.

- During first and last week of October, jaundice outbreaks were investigated in Mali colony and Tangi areas of Khurda district. Samples were referred by the district health authority for lab investigation of HAV and HEV. Out of 10 blood samples tested, all shown HAV IgM antibody and two were positive for HEV IgM antibody.

4. Investigation in Kandhamal and Keonjhar district

Table: Outbreak Investigation Report:

Place	No. of samples tested	Serotype
Balasore	30	Serotype III
Bhadrak	44	Serotype III
Cuttack	50	Serotype III
Jagatsinghpur	6	Serotype III
Jajpur	13	Serotype III
Kalahandi	1	PCR negative
Kendrapara	4	Serotype III
Keonjhar	14	Serotype III
Khorda	5	Serotype III
Mayurbhanj	12	Serotype III
Puri	3	Serotype III
Raygada	2	PCR negative

Jaundice outbreaks were investigated in Kandhamal and Keonjhar districts during first and third week of August. Cases were investigated in collaboration with district health authorities. Out of 15 blood samples tested for HAV and HEV, 13 samples shown HAV IgM antibody and all were negative for HEV IgM antibody.

5. Investigation in Kandhamal and Keonjhar district

Another jaundice outbreak was investigated in Bhadrak districts during first week of September. Samples were collected and referred by the district health authority to the lab for investigation of HAV and HEV. Out of 6 blood samples tested, 3 samples shown HAV IgM antibody and all were negative for HEV IgM antibody.

6. Investigation in a hostel in Raygada district

During first week of November, jaundice outbreak was investigated in a hostel of Raygada urban area. Samples were referred by the district health authority for lab investigation of HAV and HEV. Out of 6 blood samples tested, 5 shown HAV IgM antibody and none were positive for HEV IgM antibody.

Dengue outbreak investigation

NS1 positive samples were referred from different district laboratories for serotype PCR. During 2017 a total of 184 samples referred and the result is given below-

In all above-mentioned districts Dengue serotype III was detected.

Chickenpox Outbreak Investigation

1. Cases of Chickenpox were referred from Public Health Authority of Bhadrak, Cuttack, Jajpur and Bolangir districts for laboratory investigation. A total of 42 samples were tested for VZV IgM and 25 were found positive for the same. The report along with recommendations was communicated to the concerned health authorities.
2. Cases of Chickenpox were referred from Public Health Authority of blocks Paradeepgada and Raghunathpur, Jagatsinghpur District for laboratory investigation during last week of April. A total of 13 blood samples were tested for VZV IgM and 3 were found positive for the same. Vesicular fluid sample (n=2) were subjected to VZV PCR and both were found positive. The report along with recommendations has been communicated to the concerned health authorities.
3. Samples suspected for chickenpox were referred from Doraguda village of Boipariguda block of Koraput district during third week of December for lab investigation of VZV IgM. Out of 10 blood samples tested none were positive for VZV IgM antibody and on subsequent testing 3 samples were found positive for Measles IgM.

AES outbreak investigation

During first week of March, 2017 blood samples suspected for AES were referred for laboratory investigation from Godipatna, Pichukuli, Khurda district. Blood samples (n=7) suspected for JE were subjected to laboratory test and JE IgM antibody was not detected in any of the samples.

Measles outbreak investigation

A total of nine samples were referred by CDMO, Kandhamal from 2 residential schools of Phulbani of Kandhamal district during last week of October. All samples were found positive for Measles IgM.

Laboratory investigation support to neighbouring state

A total of 24 blood/CSF samples were received for lab investigation through Andhra Medical College,

Vishakhapatnam collected from patients presenting with fever & rash, jaundice, and encephalitis.

New techniques standardized

- RealTime PCR for Flu B and H3N2 subtype was added as new diagnostic test.
- RealTime PCR for HSV 1 and 2 were added as new diagnostic test. (Ref- Doornum GJJV, Guldemeester J, Osterhuas ADME, Niesters HGM.(2003). Diagnosing Herpesvirus infections by Real time amplification and rapid culture. Journal of Clinical Microbiology. 41(2): 567-580.)

HRD Activity

- Training on "ELISA based laboratory Diagnosis of JE" was imparted to 15 Laboratory Technicians from District Sentinel Site Labs of Malkangiri, Cuttack, Ganjam, Keonjhar, Baripada, Sundergarh, Khurda and Sambalpur districts on 1st and 2nd of March, 2017.
- A workshop on monitoring and evaluation for better project management was attended by the VRDL scientist held at IIPH, Bhubaneswar on (8 to 10th March).
- Training on "ELISA based laboratory Diagnosis of JE" was imparted to 12 Laboratory Technicians from Ganjam, Mayurbhanj, Rayagada, Deogarh, Angul, Puri, Jharsuguda, Gajapati, Cuttack and Khurda districts on 25th April, 2017
- Training on "ELISA based laboratory Diagnosis of Dengue" was imparted to one Laboratory Technicians from Paradeep CHC, Jagatsinghpur district on 13th June, 2017.
- Laboratory exposure was provided to 11 M.Sc. students from Vidyasagar University, Kolkata regarding basic knowledge on laboratory diagnosis of viral diseases.
- Three MSc students from Utkal University, Berhampur university and Odisha University of Agriculture & Technology submitted their dissertation work in area of Hepatitis B, Rota and EBV.
- Guest lecture was delivered in a workshop on, "Sensitisation for Biomedical Research" at AHRCC, Cuttack by the VRDL Scientist during August, 2017.
- A talk was delivered on, "Laboratory services in public health" at National Health Mission, Bhubaneswar by the VRDL Scientist on 30th Sept, 2017.
- A talk was delivered on preparedness and response of AES , JE and Encephalopathy at SLN medical college, Koraput (August) and at AIIMS, Bhubaneswar (July,17).
- A meeting was held on 11th Sept 2017 at RMRC, Bhubaneswar with health professionals from govt and private hospitals, IDSP, DHS, DPS, NVBDCP for networking and collaborative research.
- A national conference on VRDL was held at NIV, Pune from 26th to 27th Oct, 2017. PI and two scientists from VRDL attended the conference and presented the updates.
- One project scientist and one Research Assistant attended workshop on "Fundamentals of Biostatistics and SPSS" at Asian Institute of Public Health (AIPH), Bhubaneswar from 2nd-3rd Dec, 2017.

Future Plan

The above activities will continue for the next year. More emphasis will give on creating multi skill paramedical and health professionals to deal with viral disease surveillance and timely investigation/ management of outbreaks. Periodically training will be provided to the technical and supportive

paramedical staff for laboratory diagnosis of some of the important disease of public health concern which will support state public health system. More focus will be given to strengthen regional referral centers for rapid and effective outbreak investigations and disease surveillance to control and prevent viral outbreaks and epidemics in the country.

20. Effectiveness of diet and lifestyle intervention through Information Education Communication (IEC) tools with Angan Wadi Centres (AWCs) as the centre of knowledge dissemination for hypertension (including hypercholesterolemia and diabetes) risk reduction – a cluster randomized controlled trial.

Principal Investigator	:	Dr. B. Dwibedi, Scientist – E
Co-Invetigator	:	Chief District Medical Officer, Kalahandi, Odisha
Date of start	:	December, 2013
Duration	:	4 years
Funding	:	ICMR

Objectives:

General Objective:

To assess the effectiveness of diet and lifestyle intervention through Information Education Communication (IEC) tools with Angan Wadi Centres (AWCs) as the centre of knowledge dissemination for Non-communicable disease risk reduction.

Specific Objectives:

Primary objective:

- To assess the effectiveness of intense versus usual IEC interventions on diet and lifestyle modifications delivered by existing community-level health-workers (ASHA or equivalent) on population level blood pressure.

Secondary objectives:

- To assess the operational feasibility of integrating NCD risk reduction in community health programs through existing community level healthcare volunteers such as ASHA or equivalent.
- To assess the usefulness of trained healthcare workers to affect changes in dietary fat, fibre and salt, tobacco and alcohol consumption and increasing physical activity.
- To assess the efficacy of these interventions to evaluate changes in lipid levels and glycemia.

Methodology:

Study design: Cluster randomised controlled trial

Study population: Randomly selected tribal population of Kalahandi District of Odisha

Sampling and sampling strategy:

The required sample size in each arm of the trial is 1750. Each AWC jurisdiction area was taken as the cluster. The present study carried out in 12 randomly selected clusters in the Kalahandi district of Odisha. Each selected cluster was at least 10 km away from any other selected cluster to minimise the risk of contamination. Six clusters each included in intervention and control arms after randomisation. Subjects aged 18 and above, residing in every other household in each of these clusters was subjected to investigations to capture the NCD/hypertension risk (around 300 subjects in each cluster). This sampling strategy will meet the required sample size of 1750 in each arm of the trial.

The sequence of study

(1) The base line population based survey in intervention and control communities

All the subjects aged 18 and above will be included in the study after taking consent or assent. It has following components.

Interview

- Name, age, sex, socio-economic, and other core demographic details of the individuals
- Knowledge, Attitude, Practice in relation to NCD risk factors and NCDs: A structured and pre-tested questionnaire will be used.
- Knowledge, Attitude, Practice in relation to physical activity (Yoga, non-yoga exercises):
- Physical activity: For assessing the physical activity WHO STEPS questionnaire will be used (G-PAQ).
- Tobacco use frequency and pattern. Tobacco use frequency and pattern will be collected through structured questionnaire.
- Alcohol consumption: quantity and frequency

From the consumers of alcoholic beverages, the quantity of alcohol drunk on typical drinking occasions and the frequency of typical drinking will be collected. From this Quantity, Frequency product (QF value) consumed per year per person will be collected. The strength of alcohol in locally brewed beverages will be measured and it will be translated into local measurements [12 gm of absolute alcohol = one standard drink].

- General Health Questionnaire (GHQ 12): to assess the mental health status of the individual.

Despite its title GHQ is designed to assess mental health, not "general health". It is a measure of current mental health extensively used in different settings and different cultures. It has been extensively used in epidemiological studies in India & developed for use as a screening instrument in community settings, primary care, and medical out-patients; it focuses on breaks in normal functioning, rather than lifelong traits and concerns itself with two major classes of phenomenon.

Measurements

- *Weight:* Weight of the subjects will be measured by lever activated electronic weighing scale with accuracy of 100 gm.
- *Height:* Height of the subjects will be measured by anthropometry rod with accuracy of 2mm.
- *Waist circumference:* Waist circumference of the subjects measured by non-stretchable inch tape by adopting proper technique as suggested in WHO STEPS protocol.
- *Body fat percentage:* Body fat percentage of the subjects measured by bio-impedance machine.
- *Diet survey:* Diet survey conducted in the 30% (i.e., 75 households in each cluster) of the households in each cluster by following 24 hour recall method for single day (as followed by National Nutritional Monitoring Bureau (NNMB), India). i.e., every third household surveyed. The festival days. 30% of the households selected randomly (Systematic random sampling, first household being a random choice). Along with diet survey the details of frequency of consumption of different food groups documented.
- *Blood pressure:* Blood pressure measured by digital automatic blood pressure monitors, which have been validated and approved by International agencies such as WHO, British Hypertension Society and International Hypertension Society. Three blood pressure readings taken and WHO STEPS guideline will be followed.

Blood test:

- *Fasting glucose, total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides*

5ml of venous blood will be taken: The fasting glucose estimated by glucose oxidase method in the

field conditions at centre for nutrition, ICMR, New Delhi.

For rest of the parameters, serum will be separated in pre-labelled eppendorf vials indicating the sample ID and the date of collection and transported in dry ice to at least maintain a temperature of -20°C to NABL accredited laboratory at ICMR "Centre for Promotion of Nutrition Research and Training with special focus on North-East, Tribal and Inaccessible population", New Delhi for analysis of total cholesterol, LDL cholesterol, HDL cholesterol, triglycerides and glucose on Automatic Chemistry Analyzer (Roche Hitachi 902).

- *Haemoglobin estimation* 20 µl of blood taken in the pipette and spotted on the filter paper from each participant and the dried filter papers will then be sent to **ICMR "Centre for Promotion of Nutrition Research and Training with special focus on North-East, Tribal and Inaccessible Population"** in New Delhi within one week of collection. The analysis carried out by cyanomethemoglobin method using spectrophotometer.

All materials used in sample collection discarded using appropriate color coded bins/ bags following WHO guidelines. All needles used destroyed using needle destroyer

(2) *Intervention**

In both the groups the standard regimen for the control of hypertension, diabetes, and dyslipidemia including counselling for life style modification will be followed as indicated medically.

In the intervention group IEC campaign will be launched for hypertension/NCD risk reduction. All the risks will be targeted like overweight/obesity, physical inactivity, psychological stress, alcohol and tobacco consumption, dietary fibre, saturated fat and t-fat in the oil, dietary salt consumption etc. An earnest attempt will be made to disseminate available scientific knowledge to the community for hypertension/NCD risk reduction. One of the investigators with ASHA or equivalent will visit each house hold in all the intervention clusters (about 200-250/cluster) and make an approximate assessment of dietary oil, dietary salt, and dietary fibre consumption and physical activity level. Our targets will be the following.

a) Based on the base line data if the community consumes oils rich in saturated fats our IEC will aim to change the consumption by oils rich in MUFA & PUFA at least in 50% of the households.

b) The IEC will target an increase of 50% in the amount of dietary fibre consumption up to a maximum of 20gm/day/individual (or in other words try to increase the population mean by 50-100%).

c) It will also aim for dietary salt consumption of less than 9gm/day/individual at least among 50% of the population in intervention community (or in other words try to decrease the population mean by 50-100%).

d) The IEC will also target to increase physical activity level in rural areas where ever sedentary behaviour is observed and in urban areas to increase the population mean of the physical activity by 50% in urban areas.

e) The IEC will also target to decrease the mean consumption of tobacco and alcohol by 25%.

Repeat population based survey in intervention and control groups will follow

1. **Interim modification of objectives/ methodology (with justifications):** No modification has been made

2. **Summary on progress:**

- **Recruitment of project staff and man power development**: The project staffs were recruited.

They were trained at Centre for Chronic Disease Control, New Delhi.

- **Purchase of equipments**: Equipments to be used in the project work were purchased and some could not be purchased in 1st year and aimed for permission to procure in the 2nd year.
- **Odia translation of consent form and questionnaire**: The Consent form was prepared in the local language. Similarly, the questionnaires to be used in the study were translated to odia language for easy understanding of the local people.
- **Identification of control and intervention cluster**: For implementation of the project, control and intervention clusters were identified.

Intervention Cluster	Cluster ID
Sargiguda	01
Mahima	02
Khaliabhata	03
Urladani	04
Dedar	05
Mukundpur	06
Control Cluster	**Cluster ID**
Budfuria	07
Badabasul	08
Kandagarh	09
Dangapata	10
Pabli	11
Hirapur	12

- **Listing of households for baseline population survey:**

By door to door survey in households were listed and adult's ≥ 18 years enumerated which is given below:

Cluster id and name	Number of households	No. Of Members>=18 years in HH
Cluster 01 Sargiguda	148	397
Cluster 02 Mahima	161	447
Cluster 03 Khaliabhata	160	428
Cluster 04 Urladani	117	285
Cluster 05 Dedar	93	229
Cluster 06 Mukundpur	107	264
Total clusters (06)	786	2050

Intervention Cluster

Cluster id and name	Number of households	No. Of Members>=18 years in HH
Cluster 07 Sargiguda	160	425
Cluster 08 Mahima	113	326
Cluster 09 Khaliabhata	119	302
Cluster 10 Urladani	139	358
Cluster 11 Dedar	102	276
Cluster 12 Mukundpur	108	323
Total clusters (06)	**741**	**2010**

Baseline assessment:

Baseline assessment of the study population was carried out by personal interview. The following information was collected. Personal details, socio-economic and other core demographic details, knowledge, attitude, practice in relation to NCD risk factors, tobacco use frequency and pattern, alcohol consumption, general health questionnaire to assess the physical activity and mental health status of the individual.

Measurement of blood pressure for hypertension and other parameters were collected. Measurements included Weight, Height, Waist circumference & Body fat percentage. Blood sample collected for tests like Fasting glucose, total cholesterol, LDL cholesterol, HDL cholesterol and triglycerides and Haemoglobin estimation.

- **Demographic Details:**

Till December 2014, demographic details of 2073 individuals covered from nine clusters (Badfurla, Dangapata, Dedar, Hirapur, Kandagarh, Mahima, Mukundpur, Pabli and Urladani) have been completed. The following table shows the demographic details:

Age Group	Male	Female	Total
18-30	253	338	591
31-45	347	396	743
46-60	248	275	523
>60	105	111	216
Total	953	1120	2073

Prevalence of Hypertension in study group:

Among these 2073 individual studies, 47.17% of individuals were found to be hypertensive. Hypertension is calculated from blood pressure data. A person is said to be hypertensive if SBP $\geq$ 140 or DBP $\geq$ 90 or both. Blood pressure was measured thrice at intervals and average was taken. From percentage-wise data, hypertension was found to be more prevalent among female than male. The prevalence of hypertension was found to increase with age and almost 50% of the individuals after 45 years of age were found to be hypertensive.

Age group	Male (%)	Female (%)	Total (%)
18-30	38.33	41.42	40.10
31-45	44.38	50.75	47.77
46-60	46.37	54.18	50.47
>60	54.28	58.55	56.48
Total	44.38	49.55	47.17

Body Mass Index (BMI) among study group:

BMI of individuals were calculated as previous reports have proven that individuals having high BMI are prone to hypertension. The analysis suggests that 18.37% of individuals included in this study have BMI

Age	BMI < 23			BMI 23-25			BMI ≥ 25		
group	Male	Female	Total (%)	Male	Female	Total (%)	Male	Female	Total (%)
18-30	227	301	528(89.34)	05	13	18(3.04)	21	24	45 (7.61)
31-45	283	320	603(81.15)	20	23	43 (5.78)	44	53	97 (13.05)
46-60	168	168	336 (64.24)	06	19	25 (4.78)	74	88	162 (30.97)
>60	66	69	135(62.5)	01	03	04(1.85)	38	39	77 (35.64)
Total	744	858	1602 (77.27)	32	58	90(4.34)	177	204	381 (18.37%)

more than 25 and hence they are at risk of developing hypertension in future. This increases with age as in 18-30 age group 7.61% of individuals have more than 25 BMI whereas it increases to 35.64% in more than 60 years of age.

Hematological Investigation:

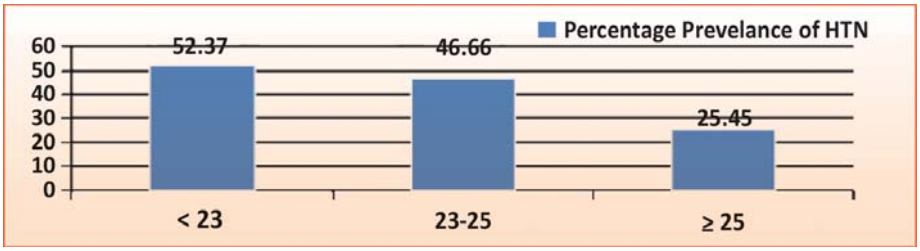
In the first phase, 230 blood samples were collected from individuals enrolled in the study and aliquots (plasma, serum etc) were sent to CNRT, ICMR, New Delhi for blood parameter analysis.

Applied value of the project:

The study gives an idea on prevalence of hypertension in Tribal population along with risk factors. This will be useful in developing a community intervention strategy for use in the National program especially for Tribals.

BMI and Hypertension:

An analysis was done to observe relationship between BMI and hypertension among the studied population and it was found that hypertension is also prevalent in BMI < 25.



Distribution of various physical parameters: Related to CVD risk

Age Group	Mean body fat percentage			Mean bone mass			Mean body muscle mass			Mean visceral fat percentage		
	M	F	Total	M	F	Total	M	F	Total	M	F	Total
18-30	14.0	24.07	19.78	46.86	40.2	43.06	8.55	8.30	8.41	2.35	1.73	1.99
31-45	15.3	24.75	20.33	40.76	36.4	41.25	7.87	6.77	7.28	3.72	2.44	3.04
46-60	14.6	24.38	19.77	44.79	37.5	40.96	7.88	7.61	7.74	4.13	2.96	3.52
>60	14.7	24.75	19.88	44.71	37.0	40.85	7.76	7.35	7.53	5.37	3.38	4.35
Total	14.7	20.45	19.99	46.05	37.9	41.65	8.04	7.50	7.75	3.65	2.45	3.00

Community risk behavior of Hypertension:

Of the studied population various community risk behaviour of hypertension was calculated.

Parameters	Prevalence (%)
Tobacco Consumption	58.33
Alcohol Consumption	39.21
Low Physical Activity (sedentary)	42.85
Iodine Salt Intake (≥ 5 gm per day)	88.1
Iodine Salt Intake (≥10 gm per day)	46.42

Future Plan

The baseline survey is planned to be completed within next 6-7 months, which will follow formative strategy and IEC materials development. Interventions will be given as per plan in the 2nd Year and evaluation will follow.

Details of work as on January 2018:

End line survey is continuing in the area to compare the changes in lifestyle and risk factor as well as blood pressure in the study area. Repeat house hold and population enumeration was done and random sampling was followed for selection of house hold for repeat endline survey. Questionaire based socio-behavioural and life style changes as well as CVD risk is being assessed similar to the baseline survey. Blood pressure measurement is also repeated to assess the

Cluster Name (Village)	Cluster ID	No. of Questionnaire	No. of Anthropometrics	No. Addl. Diet & Nutrition form fill up
Sargiguda	0601	245	162	245
Mahima	0602	0	0	0
Khaliabhata	0603	264	264	264
Urladani	0604	210	250	210
Dedar	0605	284	286	284
Makundpur	0606	239	210	239
Badfurla	0607	257	257	257
Badbasul	0608	277	287	277
Kandagarh	0609	291	291	291
Dangapata	0610	211	210	211
Pabli	0611	10	0	10
Hirapur	0612	0	0	0
Total				

changes. All the information are essential to the central database using tablet based software. The coverage of the study population is given in the following table.

21. Molecular dynamics simulation-based study of RND Efflux Pump mediated antibiotic resistance in gram negative Bacilli and search for remedies from plant resources of North East India.

Principal Investigator : Dr.Debdutta Bhattacharya, Scientist-C & Dr.Pankaj Chetia (Dibrugarh University)

Co-Investigator : Dr. N. Mahapatra & Prof. Bijoy Neog (Dibrugarh University)

Date of initiation : 18th October, 2016

Duration : 3 years

Funding agency : Dept. of Biotechnology, Govt. of India

Background

The aim of this proposed project is to investigate the various types of antibiotic resistant gram negative bacilli found in different hospitals in Assam. In recent past, the antibiotic resistance among different bacteria has raised a large-scale health issue. To avoid this crisis, identification of suitable compound(s) or remedial measure(s) has become essential. Principally, antibiotic resistance in gram negative bacteria is efflux pump mediated and herbs may become a better supplement to combat this pump affect. As the proposed study area is Assam, the state well known for the richness in floral diversity and till date different tribes of this state rely on the locally available medicinal plants. Hence, this project focuses to identify the medicinal plants and their active principles which may help in fighting the efflux pump mediated antibiotic resistance in gram-negative bacilli.

Though, the North Eastern India is rich in ethnic diversity and their traditional knowledge, the proper value addition to this rich culture is left pending. Many medicinal plants are still unexplored. On the other hand, due to the lack of awareness and improper use of antibiotics, many pathogenic microbes are getting resistant to different antibiotics in the course of time. This is drastic and very much vulnerable as per as health scenario is concerned. In addition, no proper study has been undertaken till date to sort-out this problem in this region.

Therefore, considering the need of the hour, this proposal has been designed to carry out extensive study to understand the threat scenario of antibiotic resistance of different microbes, especially gram negative Bacilli in the region as well as to identify potential medicinal plant(s) and herbal compound(s) which may help in fighting the resistant microbes. The project also aims to study the mechanism of different efflux pumps and the proteins involved using molecular dynamics simulation. This will help in identifying a proper mechanism to overcome the threat of antibiotic resistance. This piece of research will not only explore the scenario of antibiotic resistance of pathogenic microbes in the region, it will also help in some way to overcome the threat of antibiotic resistance problem in near future.

Objectives of the study

Dibrugarh University

1. To isolate and identify the MDR gram-negative bacilli from various clinical cases admitted/ attending different wards of Assam Medical College & Hospital, Dibrugarh and Jorhat Medical College & Hospital, Jorhat.
2. Collection of medicinal plants like Capsicum chinense, Flacourtiajangomas, Garcinia spp. and extraction and screening of efflux pump inhibitory (EPI) activity and antimicrobial activities.
3. In silico studies to understand the role of RND Efflux pump proteins and to study the EPI activity using isolated natural products.

RMRC, Bhubaneswar

1. To study the drug resistance pattern of the bacterial isolates.
2. Bacterial susceptibility determinations:

Progress:

In the first 12 months RMRC, Bhubaneswar was supposed to complete procurement of consumables, pure culture of MDR strains supplied from Dibrugarh University.

A total of 108 clinical isolates collected from the Assam Medical College and Hospital were sent by Dibrugarh University for identification and characterization in 2 batches. All the 50 isolates were streaked on to MacConkey Agar and Hektoen Enteric Agar plates and incubated at 37R"C for 18-24 hours to obtain pure culture of Gram negative bacilli.

The isolates were then subjected to a panel of biochemical tests including Oxidase, Triple Sugar Iron (TSI) agar, Mannitol Motility, IMViC and Urease for their presumptive identifications. Serological identification of few strains was performed typically by slide agglutination with polyvalent somatic (O) antigen grouping sera (Denka Seiken Co. Ltd., Tokyo, Japan), followed by testing with monovalent antisera for specific serotype identification.

Out of 108 isolates, 81 isolates were grown in pure culture. These 81 isolates were then subject to various biochemical tests followed by serological techniques as per standard guidelines. Routine biochemical tests include lactose, sucrose and glucose fermentations, acid/gas production, H_2S production, mannitol fermentation, motility tests, indole production tests, urease production test, MR/VP tests, catalase tests and oxidase test.

Among these 81 isolates, *E.coli* (51%; 41 of 81) accounted for majority of the isolates, followed by *Klebsiella* sp. (21%; 17 out of 81), *Pseudomonas* sp. (14%; 11 of 81), *Acinetobacter* sp. (11%; 9 of 81) and *Citrobacter* sp. (3%; 3 of 81). The details of the isolates are provided below.

Among these 81, 40 isolates were subjected to Antimicrobial susceptibility tests on Mueller-Hinton agar plates by the disc diffusion method (Baur Kirby, CLSI 2016) using commercially available disks (22 antibiotics blonging to various classes aminogylosides, quinolones, cephalosporins, phenicols, penicillin, tetracycline, sulphonamides etc.).

Escherichia coli ATCC 25922 and *Staphylococcus aureus* ATCC 25923 strains were included in the assay as quality control strains.

The MICs of Imipenem were determined for each resistant strain by using the E-test (AB Biodisk, Sweden), and the readings were interpreted using the Clinical & Laboratory Standard International (CLSI, 2016) breakpoint criteria.

A wide spectrum of antibiotic resistance was observed among the *isolates* obtained. Resistance to commonly used drugs were also observed among the isolates. Overall and genus wise resistance to various antibiotics is provided, **Amikacin** (30%; 12/40) (*E. coli* 30% 6/20, *Acinetobacter* 33% 2/6, *Pseudomonas* 12.5 % 1/8, *Klebsiella* 50% 3/6), **Amoxyclav** (85%; 34/40) (*E. coli* 95% 19/20, *Acinetobacter* 66.67% 4/6, *Pseudomonas* 75 % 6/8, *Klebsiella* 83.33% 5/6), **Ampicillin** (90%; 36/40) (*E. coli* 95% 19/20, *Acinetobacter* 50% 3/6, *Pseudomonas* 100% 8/8, *Klebsiella* 100% 6/6), **Azithromycin** (70%; 28/40), (*E. coli* 90% 18/20, *Acinetobacter* 33.33% 2/6, *Pseudomonas* 62.5 % 5/8, *Klebsiella* 50% 3/6), **Carbenicillin** (80%; 32/40), (*E. coli* 95% 19/20, *Acinetobacter* 83.33% 5/6, *Pseudomonas* 37.5 % 3/8, *Klebsiella* 83.33% 5/6), **Cefepime** (47.5%; 19/40) (*E. coli* 65% 13/20, *Acinetobacter* 33.33% 2/6, *Pseudomonas* 25 % 2/8, *Klebsiella* 33.33% 2/6), **Cefotaxime** (77.5%, 31/40), (*E. coli* 85% 17/20, *Acinetobacter* 83.33% 5/6, *Pseudomonas* 50 % 4/8, *Klebsiella* 83.33% 5/6), **Ceftazidime** (72.50%, 29/40), (*E. coli* 85% 17/20, *Acinetobacter* 66.67% 4/6, *Pseudomonas* 37.5 % 3/8, *Klebsiella* 83.33% 5/6), **Ceftriaxone** (72.5%; 29/40) (*E. coli* 80% 16/20, *Acinetobacter* 83.33% 5/6, *Pseudomonas* 50 % 4/8, *Klebsiella* 66.67% 4/6), **Chloremphenicol** (37.5%, 15/

40) (*E. coli* 25% 5/20, *Acinetobacter* 50% 3/6, *Pseudomonas* 87.5 % 7/8, *Klebsiella* 0/6), **Ciprofloxacin** (50%; 20/40), (*E. coli* 75% 15/20, *Acinetobacter* 33.33% 2/6, *Pseudomonas* 25 % 2/8, *Klebsiella* 16.67 % 1/6), **Cotrimoxazole (**62.5%; 25/40), (*E. coli* 65% 13/20, *Acinetobacter* 50% 3/6, *Pseudomonas* 100 % 8/8, *Klebsiella* 16.67% 1/6), **Gentamycin** (30%; 12/40) (*E. coli* 50% 10/20, *Acinetobacter* 16.67% 1/6, *Pseudomonas* 12.50 % 3/8, *Klebsiella* 0/6), **Gatifloxacin** (52.5%; 21/40), (*E. coli* 75% 15/20, *Acinetobacter* 33.33% 2/6, *Pseudomonas* 25 % 2/8, *Klebsiella* 33.33% 2/6), **Imipenem** (55%; 22/40), (*E. coli* 60% 12/20, *Acinetobacter* 50% 3/6, *Pseudomonas* 37.5 % 3/8, *Klebsiella* 66.67% 4/6), **Levofloxacin** (47.5%; 19/40), (*E. coli* 70% 14/20, *Acinetobacter* 33.33% 2/6, *Pseudomonas* 25 % 2/8, *Klebsiella* 16.67% 1/6), **Nitrofurantoin** (70%; 28/40), (*E. coli* 50% 10/20, *Acinetobacter* 83.33% 5/6, *Pseudomonas* 100 % 8/8, *Klebsiella* 83.33% 5/6), **Norfloxacin** (47.50%; 19/40), (*E. coli* 70% 14/20, *Acinetobacter* 33.33% 2/6, *Pseudomonas* 25 % 2/8, *Klebsiella* 16.67% 1/6), **Ofloxacin** (47.5; 19/40), (*E. coli* 70% 14/20, *Acinetobacter* 33.33% 2/6, *Pseudomonas* 33.33 % 2/8, *Klebsiella* 16.67% 1/6), **Tetracyclin** (35% 14/40), (*E. coli* 45% 9/20, *Acinetobacter* 33.33% 2/6, *Pseudomonas* 37.5 % 3/8, *Klebsiella* 0/6), **Piperacillin/tazobactum** (62.5% 25/39), (*E. coli* 80% 16/20, *Acinetobacter* 33.33% 2/6, *Pseudomonas* 25 % 2/8, *Klebsiella* 83.33% 5/6).

During the study period, out of 40 isolates, 22 were found to be resistant to Imipenem by disc diffusion method. All these 22 strains were subjected to MIC determination for Imipenem by E-test. Among these 22 strains, 7 were above the CLSI breakpoint for resistance. One isolates showed intermediate resistance. The MIC of the resistant strains ranged between 6-32ug/ml.

Among the 40 isolates, 29 were found to be resistant to all the 3rd generation cephalosporins. All these strains will be subjected to MIC determination & ESBL production.

Genomic DNA was isolated from overnight grown cultures of each of the 5 isolates resistant to Imipenem from ovrnight broth following cetyltrimethylammoniumbromide method (Ausubel et al., 1999). Plasmid DNA was extracted by QIAGEN plasmid mini kit for the 7 strains which showed complete resistance to Imipenem drug.

These 7 strains which include 3 *E.coli*, 2 *Acinetobacter sp.* and one each of *Klebsiella* and *Pseudomonas* sp. were subjected to PCR based detection of *New Delhi metallo-â-lactamase 1 (NDM-1)* gene harbored in the plasmid. Among these 7 strains, 4 isolates showed the band of size 264bp corresponding to NDM-1 confirming the presence of *NDM-1* gene. All these 4 samples will be processed for sequencing.

Summary and Conclusions of the Progress made so far

- A total of 108 isolates were obtained from Dibrugarh University which were cultured and processed isolation & identification of strains based on various biochemical, serological & molecular techniques.
- A total of 81 isolates were grown in pure culture
- Among these 81 isolates, *E.coli (51%; 41 of 81)* accounted for majority of the isolates, followed by *Klebsiella sp. (21%; 17 out of 81), Pseudomonas sp. (14%; 11 of 81), Acinetobacter sp. (11%; 9 of 81)* and *Citrobacter sp. (3%; 3 of 81).*
- A total of 40 isolates were subjected to Antimicrobial susceptibility tests by the disc diffusion method
- Most of the strains were multi-drug resistant
- Among the 40 isolates, 29 were found to be resistant to all the 3rd generation cephalosporins. All these strains will be subjected to MIC determination & ESBL production.
- A total of 7 strains had MIC value above CLSI breakpoint for Imipenem, of which 4 were found to harbour New Delhi *metallo-â-lactamase 1 (NDM-1)* gene by PCR conferring resistance to Imipenem.

Table 1. ABST pattern of the 40 isolates obtained in pure culture.

Sl No.	Strain No.	ABST																				
		AMK	AMC	AMP	AZM	CB	CPM	CTX	CAZ	CTR	CHL	CIP	CoT	GAT	GEN	IPM	LE	NIT	NX	OF	TE	PIT
1	AMCH 1	R	R	R	R	R	R	R	R	R	I	R	R	R	I	I	R	R	R	R	R	R
2	AMCH 2	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	I	R	R	R	R
3	AMCH 3	S	R	S	S	R	S	R	R	R	R	S	R	S	R	R	S	R	S	S	R	S
4	AMCH 4	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R
5	AMCH 5	I	R	R	R	R	R	R	R	R	S	R	S	R	I	R	R	R	R	R	S	R
6	AMCH 7	R	R	R	I	R	S	R	R	R	S	S	S	R	S	R	I	R	S	S	S	R
7	AMCH 8	R	I	R	R	R	S	I	R	S	S	R	S	S	R	I	S	R	S	S	S	I
8	AMCH 9	S	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	S	R
9	AMCH 10	S	R	R	I	R	R	R	R	R	S	S	S	S	S	S	S	S	S	S	S	R
10	AMCH 11	S	R	R	R	R	S	I	S	S	R	I	R	I	S	S	S	R	S	S	I	S
11	AMCH 12	S	R	R	R	S	S	S	S	I	R	S	R	S	S	I	S	R	S	S	I	S
12	AMCH 14	I	R	R	R	R	R	R	R	R	S	R	R	R	R	I	R	S	R	R	R	R
13	AMCH 16	I	R	R	I	R	S	R	R	S	S	I	R	I	I	I	I	I	I	I	I	R
14	AMCH 17	S	R	R	R	R	R	R	R	R	I	R	R	R	I	R	R	R	R	R	S	R
15	AMCH 18	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R
16	AMCH 21	S	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	S	R
17	AMCH 22	S	S	R	S	I	S	R	I	I	R	S	R	S	S	S	S	R	S	S	R	S
18	AMCH 23	R	I	R	R	R	I	R	R	R	S	I	I	I	I	I	I	R	I	I	S	R
19	AMCH 24	I	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R
20	AMCH 25	I	R	R	I	R	R	R	R	R	S	S	I	I	I	R	S	R	S	S	S	R
21	AMCH 26	I	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	I	R	R	S	R
22	AMCH 27	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
23	AMCH 28	S	R	R	S	S	S	I	I	I	R	S	R	S	S	R	S	R	S	S	I	S
24	AMCH 29	S	R	R	I	R	S	R	I	R	R	S	I	S	S	R	S	R	S	S	S	I
25	AMCH 30	S	R	R	R	R	I	R	R	R	S	R	R	R	S	R	R	S	R	R	R	R
26	AMCH 31	S	R	R	R	R	S	R	I	I	S	R	R	R	I	I	R	R	R	R	R	R
27	AMCH 32	R	R	R	R	I	S	I	S	S	S	S	S	S	I	R	S	R	S	S	S	I
28	AMCH 33	I	R	S	R	I	S	I	S	S	S	S	S	S	I	R	S	R	S	S	S	S
29	AMCH 34	I	R	R	R	R	S	R	R	R	S	S	S	S	I	R	S	I	S	S	S	R
30	AMCH 35	R	S	I	S	R	S	R	R	R	S	I	S	S	S	S	S	R	S	S	S	I
31	AMCH 36	S	R	R	R	S	S	S	S	S	R	S	R	S	S	S	S	R	S	S	I	S
32	AMCH 38	S	S	R	R	S	S	I	I	R	R	S	R	S	S	S	S	R	S	S	I	S
33	AMCH 39	S	R	R	R	R	S	R	R	R	S	R	S	R	I	R	R	R	R	R	S	R
34	AMCH 41	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
35	AMCH 42	S	R	R	S	R	R	R	R	R	S	S	S	R	S	I	S	I	S	S	R	R
36	AMCH 44	R	R	R	R	R	R	R	R	R	S	R	S	R	R	R	R	I	R	R	R	R
37	AMCH 45	S	R	R	R	R	R	R	R	R	S	R	R	R	I	I	R	S	R	R	S	S
38	AMCH 46	S	R	R	S	R	I	R	R	R	R	S	R	S	S	I	S	R	I	S	R	I
39	AMCH 49	S	R	R	R	R	R	R	R	R	S	R	R	R	R	I	R	I	R	R	S	R

22. Anthrax in Odisha: Road Map for prevention.

Principal Investigator	:	Dr. Debdutta Bhattacharya, Scientist-C
Advisor	:	Dr. Sanghamitra Pati
Co-Investigator	:	Dr.M.R.Ranjit, Dr.M.Bal
Date of initiation	:	1st April 2017
Duration	:	10months.
Funding	:	Public Health Foundation of India, New Delhi

Background

Anthrax is a serious infectious disease caused by gram-positive, rod-shaped bacteria known as *Bacillus anthracis*. The anthrax bacterium produces spores which are capable of surviving for many years in the environment. Anthrax most commonly occurs in wild or domesticated warm-blooded grazing animals such as sheep and cattle, but can infect humans causing three types of infections affecting the lungs (pulmonary form), the digestive tract (intestinal form), or the skin (cutaneous form). All types of anthrax can eventually spread throughout the body and cause death if not treated with antibiotics appropriately at appropriate time.

Anthrax is most common in agricultural regions of Central and South America, Sub-Saharan Africa, Central and South-western Asia, Southern and Eastern Europe, and the Caribbean. In India anthrax is enzootic in states like Andhra Pradesh, Jammu and Kashmir, Tamil Nadu, Odisha and Karnataka (NCDC, 2005). During last 15 years out of 30 revenue districts in Odisha, 14 districts have witnessed outbreaks of anthrax affecting at least 1208 people of which 436 had died (Patil 2010 and IDSP, Odisha 2016). The anthrax outbreaks are an annual phenomenon in the state and the most frequently affected districts are Koraput, Raygada, Malkangiri, Sundergarh, Deogarh, Anugul and Kandhamal, whereas the occurrence of anthrax in other districts such as Nawrangpur, Nuapada, Mayurbhanj, Baragarh, Sambalpur, Bolangir, Nayagarh and Cuttack are recorded at long intervals. From the available information it has been observed that very often the tribal communities those who eat or handle carcass of dead animals of these districts have been affected. Among the animal cattle, buffalo, sheep, goat and pigs are most susceptible animals and the disease is seen in the state round the year in the aforesaid animals. The morbidity rate due to anthrax in animals was 1.45% and the mortality rate was 12.56 % with case fatality rate of 30.20 % and spread over 19 districts in the state. Since the state with a good forest cover possesses soil enriched with organic and moisture contents, it supports the process of germination or in maintaining spore's viability. Herbivores, the primary hosts of this pathogen, are usually infected anthrax by ingestion of spores while grazing or browsing. Human infection was usually a result of contacting ill animals during agricultural activities or processing contaminated animal products. Limited person-to-person transmission has been reported. As majority of the tribal areas have poor public health infrastructure, it makes the perfect amalgamation and interface of risk factors that are conducive for zoonotic transmission of anthrax to the human population. Hence the probability of occurrence of anthrax outbreak in the human population would increase on logarithmic scale, each time an episode of anthrax detected in animal population.

From vulnerability point of view Odisha is highly prone to risk of anthrax outbreaks in the human population in the coming years because the state has very high concentration of tribal population (>22 %) who depend less on agriculture and more on forest and animal produce for food because of illiteracy and poverty. But it has been observed that in areas where domestic animals have had anthrax in the past, routine vaccination can help prevent outbreaks (CDC, 2015).

The state animal husbandry department is going to implement a containment programme by conducting mass vaccination of animals (~19 lakh) and through massive awareness campaign among public on safe handling and non-consumption of meat of affected animals and deep burial of dead animals with lime treatment to prevent transmission in the 19 endemic districts (News clip, Indian Express 28/9/2016). Hence situation specific appropriate strategies can be developed to prevent the spread of outbreak of the disease. In the proposed study we are planning to develop a road map to control and prevent the outbreak of anthrax in the state. During the 1st phase we will attempt to identify the hot spots of transmission and build up a strong intersectoral collaboration for implementation of the strategy.

Goal/Aim

To assess the magnitude, identify the correlates, explore both supply and domain barrier and to reduce the morbidity and mortality due to anthrax by implementing novel control measures in high risk areas of Odisha

Objectives

- To describe the epidemiology and examine the transmission dynamics of anthrax in Odisha.

Results:

Total 557 households were covered in 4 districts -Koraput, Rayagada, Malkangiri, Sundargarh.

DISTRICT	BLOCK	VILLAGE	HOUSEHOLD COVERED
Koraput(K)		R.Maliguda	5
		Ghataguda	6
		Bilaiguda	8
		Dudhari	13
	Semliguda	Kakriguda	6
		Mandarguda	12
		Konkodaambo	11
		Jagamput	4
		Charagaon	2
		Majhiput	13
		Sakiaguda	3
	Nandapur	Khatalput	5
		Khadagpur	15
		Badlipondi	6
	Dasmantpur	K.dandabada	9
		Mundar	4
		Mundajhola	5
		Tikrapada	10
		Kodkipadar	6
		Janiguda	9
		Khajuriguda	3
	Boipariguda	Goyaljodi	4

		Ganjiguda	1
		Mandikjharan	6
		Kadalipadar	6
		Musapadar	3
	Lamtaput	Tukum	11
		Gelaguda	8
		Guneipada	7
		Badsagar	7
		B.lugum	6
		Bodpada	6
		Potenda	6
	Kundra	Narakenduguda	8
		Kumbhikari	7
		Pradhaniput	7
Malkangiri (M)	Khaiput	Buddural	7
		Boriguma	23
		Taldeska	14
		Dabadiguda	18
Rayagada	Kashipur	Kappadang	20
		Baharkutumbi	8
		Jamuguda	19
		Haridaspur	17
Sundargarh	Sundargarh	Rupidihi	09
		Karanjkhol	09
		Dumabahal	10
	Lephripara	Harasmara	11
		Masabira	11
	Subdega	Kirelaga	15
		Malpada	15
		Saghjhor	10
	Kurta	Jhariadepa	06
		Kirengsera	11
	Nuagaon	Hatibari	12
		Mangratolli	07
		Koilatolli	09
		Goldaru	06
	Kuarmunda	Tetrabahal	16
	Rajgangpur	Tungripada	11
	Bisra	Birikera	11
TOTAL			**557**

INTERVIEWS:

A total of 49 IDIs were conducted with various officials of state which includes, Health dept., Animal husbandry, Forest and Environment and Administration

DEPARTMENTS			
	STATE		BLOCK
Health department	Deputy Director Public Health State Epidemiologist	Chief District Medical Officer (Koraput, Malkangiri) Add. District Medical Officer-Public Health (Koraput,Rayagada, Sundargarh)	Medical officer In-charge (Koraput-4/Malkangiri-1/Rayagada-2/sundargarh-8)
Animal husbandry department	Add. Director-ADRI	Chief District Veterinary Officer (Koraput, Rayagad,sundargarh) Add. District Veterinary Officer (Koraput,Rayagada)	Block Veterinary Officer (09) Add. Block Veterinary Officer (1) Veterinary Surgeon (K-2)
Forest and Environment department	NIL	RANGER (Koraput)	NIL
Administration	NIL	NIL	Block Development Officer (7)

Focussed Group Discussions: Total 11 FGDs were conducted in various blocks of these districts

Findings:

The total respondents taken for the study is 557 respondents.

District	No. of blocks	No. of respondents
KORAPUT	6	252
MALKANGIRI	1	7
RAYAGADA	1	119
SUNDARGARH	8	179

- To explore the socio-cultural practices and analyse the epidemiological correlation of the disease
- To identify the barriers in the prevention and control of anthrax in the state
- To explore the perspectives of key stakeholders towards control and management of anthrax
- To assess the health system related factors.

Criteria for selection of respondents :

The areas which are endemic of anthrax those areas were chosen. The blocks and villages were chosen according to the list provided from the IDSP (Integrated Disease Surveillance Programme) department, Department of Public Health, Odisha. The interviews of the unaffected respondents as well as those who were affected with anthrax were conducted. The number of respondents of a village were taken from the 10% of total village population.

Data collection tool :

The data from the respondents were collected by means of a questionnaire which was a structured interview schedule which consisted of close ended and open ended questions. Before the starting of interview the consent form was asked to fill. The first part covers the respondent details, socio-economic background, the second part is their practice and behaviour, information of domestic animal, food habits, knowledge assessment & awareness of the respondent about anthrax.

The interview of health workers (ASHA, ANM, AWW, MPHW (Male and female), livestock inspector (LI), forest guard was conducted by using the questionnaire. Indepth interview was conducted for the stakeholders of health department , veterinary department and the administration department by using a unstructured questionnaire. Focus Group Discussion was conducted by using a checklist of probes.

Data analysis:

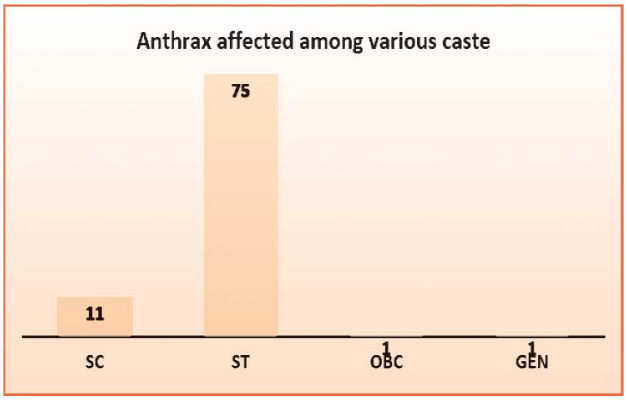
The data was entered using EXCEL and analysis is being done using SPSS which is still continuing. SPSS was used to derive frequency tables of variables

Socio-demographic characteristics of respondents:

Sex (n=557)	Male	391
	Female	166
Marital status (n=557)	single	35
	married	481
	divorced	1
	widow	26
	separated	2
	widower	12
Family type (n=557)	joint	246
	nuclear	311
Educational level (n=557)	illiterate	306
	primary	79
	secondary	129
	higher secondary	33
	tertiary	10
Mode of earning (n=557)	service	31
	business	27
	agriculture	428
	daily labour	49
	unemployed	22
Skin related work (n=557)	leather worker	3
	musical instrument (drum making	3

Information regarding Anthrax infected respondents:

During the survey, 88 individuals with past infection of Anthrax were encountered. The caste distribution among the cases are as follows: -

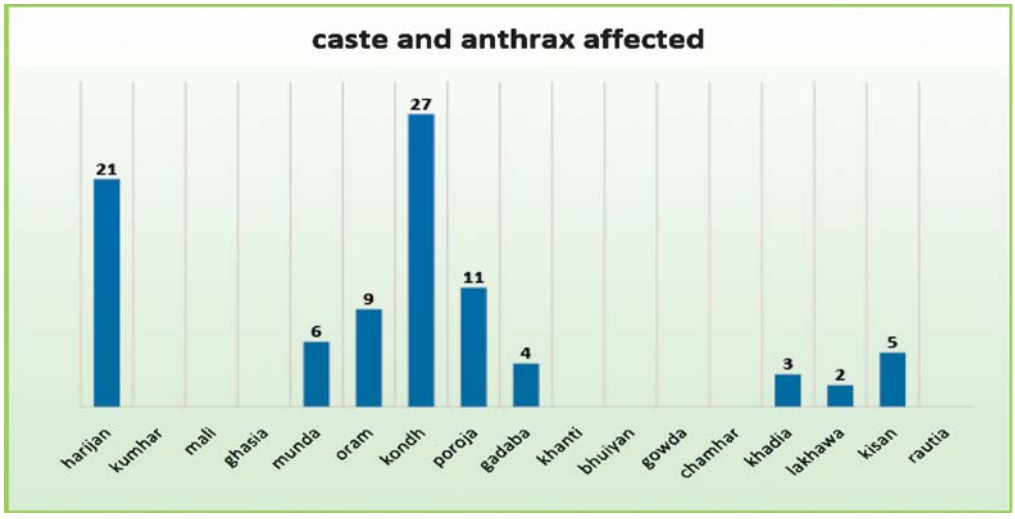


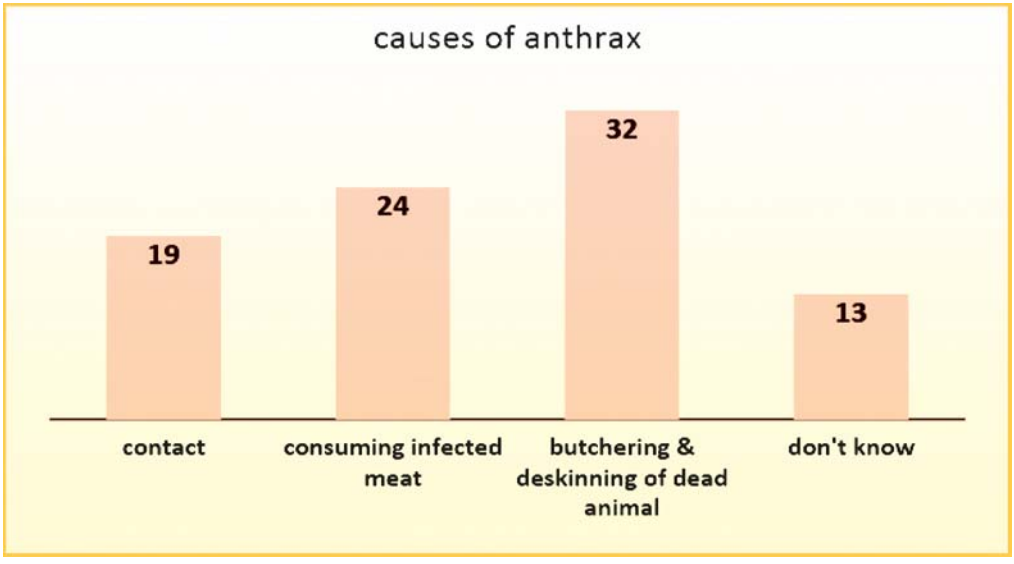
Distribution of different scheduled tribes among those who are anthrax affected.

and to find whether there is any association between the various variables. Qualitative data is being transcribed and coding is being continuing.

Limitation of the study:

Some of the villages and blocks were not visited due to inaccessibility. Due to time constraint and due to lack of funds only 557 respondents were interviewed.





Causes of anthrax found among total 88 cases were: Livestock vaccination details:

Out of total 557 responses the vaccination details:

Characteristics	responses	frequency	percent
Vaccination of livestock	yes	389	31.2
	no	165	13.2
	don't know	3	0.2
Who does the vaccination	No response	168	13.5
	veterinary doctor	8	0.6

	livestock inspector	381	30.6
How much money charged for vaccination	No response	203	16.3
	Rs 2-5	289	23.2
	Rs 10	38	3
	Rs 15-20	10	0.8
	Rs 25-50	6	0.5
	Rs 50 & above	11	0.9
Vaccination is free of cost or not	No response	168	13.5
	yes	61	4.9
	no	328	26.3

Food habits			
		frequency	percent
Do you consume meat	1. yes	524	94.1
	2. no	33	5.9
how often do you consume meat	1. once in a week	94	16.9
	2. twice in a week	17	3.1
	3. once in a month	96	17.2
	4. occasionally	306	54.6
	5. during festival	7	1.3
	6. when money is available	4	0.7
	no response	33	5.9
how do you cook	1. boiling	105	18.9
	2. cooking with oil	415	74.5
	3. not properly cooked	4	0.7
	no response	33	5.9
what form do you consume	1. cooked	516	92.6
	2. raw	1	0.2
	3. dried	2	0.4
	4. boiled	2	0.4
	5. cooked & dried	3	0.5
	no response	33	5.9
do you preserve your meat	1. yes	57	10.2
	2. no	467	83.8
	no response	33	5.9
do you take animal blood	1. yes	159	28.5
	2. no	365	65.5
	no response	33	5.9
do you consume dead animal?	1. yes	99	17.8
	2. no	425	76.3
	no response	33	5.9

Knowledge and awareness about anthrax among the respondents:

Knowledge and awareness among the total 557 respondents.

Questions asked to the respondents	Responses	Frequency	Percent
Have you heard about anthrax	yes	440	79
	no	87	15.6
	don't know	30	5.4
Where do you came to know about anthrax	No response	117	21
	newspaper	5	0.9
	doctor	314	56.4
	ANM/ASHA/AWW/ Health worker	46	8.3
	people	61	11
	veterinary department	10	1.8
	self	4	0.7
Who all are affected from anthrax	No response	87	15.6
	human	101	18.1
	livestock	41	7.4
	human & livestock	146	26.2
	none	1	0.2
	don't know	181	32.5
How anthrax is transmitted	No response	267	47.9
	air	5	0.9
	food	145	26
	contact with infected animal	92	16.5
	all of the above	1	0.2
	food & contact with infected animal	47	8.4
Awareness programme from health department	yes	375	67.3
	no	103	18.5
	don't know	79	14.2
Awareness programme from veterinary department	yes	233	41.8
	no	206	37
	don't know	118	21.2

Sometimes respondents used to give interview in front of ASHA, health worker (male), Public health education officer (PHEO) which might have their effect on the responses that they gave. So, biased views in some cases cannot be neglected.

In some cases respondents were not able to answer certain questions. For eg:- who all are affected about anthrax, how it is transmitted, whether they consume dead/sick animal.

Community practices regarding burial of dead animal among the respondents in the 4 districts:

		District				Total
		Koraput	Malkangiri	Rayagada	Sundargarh	
What do you do with the dead animal	no response	10	0	1	16	27
	burial	193	4	96	138	431
	incineration	2	0	1	1	4
	consume the meat	23	0	5	2	30
	throw outside	20	3	15	16	54
	give to chamar for skin	1	0	0	4	5
	give to others	1	0	1	0	2
	leave it like that	1	0	0	1	2
	sale the animal	1	0	0	1	2
Total		252	7	119	179	557

		District				Total
		Koraput	Malkangiri	Rayagada	Sundargarh	
What you do if animals are infected	report to the livestock inspector	222	4	108	160	494
	take to the veterinary hospital	6	0	3	0	9
	kill the animal & consume it	8	1	0	0	9
	keep it in isolation	2	0	2	0	4
	keep along with other animals	4	2	4	0	10
	don't have cattles	1	0	0	18	19
	inform ASHA/ANM/AWW	5	0	0	0	5
	don't know	4	0	2	1	7
Total		252	7	119	179	557

IEC activities carried out in different districts.

Preliminary interpretations

1. **Resources:** it was observed that only one livestock inspector is assigned for 2-3 GP which cover huge area. There is requirement of more medical staffs. Many in veterinary are lying vacant.
2. **Poverty and food security:** People don't have enough money and only depend on agriculture, live stock and forest products. We found that there is lack of food security. Agriculture is the

main occupation of the people. As most area is covered by hills and forest, there is no enough land for cultivation.

3. **Illitracey:** Majority of population in Koraput, Malkangiri, Rayagada and Sundargarh district are tribal people and lack basic education. Some of ASHAs are illiterate.

4. **Awareness:** the awareness level is too low among ASHAs and AWWs. Community has minimum information and awareness about anthrax and disposal of carcasses.

5. **IEC Activities :** There is lack of IEC activities. There is lack of any IEC materials in CHS & PHCs for anthrax awareness. There is no on-going IEC activities going in the community level.

6. **Training :** ASHAs are not trained enough to identify the case of anthrax. They do not have adequate knowledge about the causative organism, the mode of transmission, medicine that are given to treat anthrax. They lack training of carcasses disposal. Specific training on anthrax is required at every level.

7. **No SOP and Guidelines:** there is no standard guideline/handbook available for anthrax management, identification of case, carcasses disposa and treatment for the grass root level workers. There is no written SOP for higher official too.

8. **Geographical Location:** As the district is mostly covered by forest and hills, it lacks proper communication. There are places which are surrounded by rivers and dense forest with no proper road and transport option.

9. **Incomplete Vaccination:** In complete vaccination of livestock is another issue. Some people in certain villages don't cooperate in vaccination. The cost of the vaccination also hampered the effective vaccination of the livestock as the people can not afford the cost of vaccination of Rs. 10 per animal.

10. **Lack of Inter-Department Coordination:** different departments like health, veterinary, forest deptt, district administration gathers for a meeting after an out break but after few days the department do not put much attention to the issue. The lack of coordination is observed among the village departments.

11. Males are more affected than females. As male involve in slaughtering, butchering and deskinning of animals.

12. **Cutaneous Anthrax:** Most common form of anthrax among the patients found in the villages is cutaneous anthrax. Still people involve in deskinning of dead animals is most of the villages.

13. **Cooking Process:** The cooking practices among these population involves only boil and addition of spices which may not kill the spores efficiently.

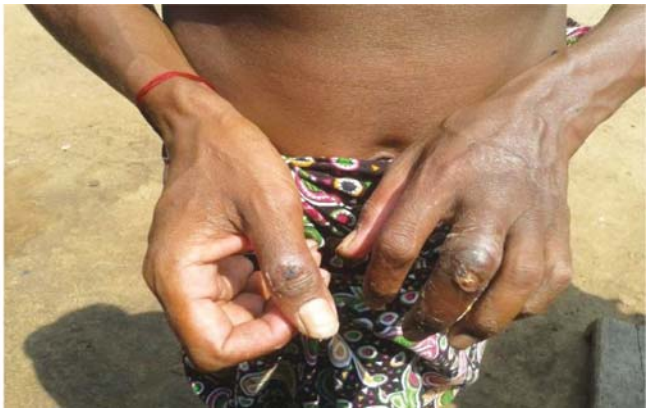
14. **Political Commitment**: More political commitment is required for effective management of the disease.

15. **Hygiene:** they lack personal hygiene like cleaning of cattle shed.

16. **Lack of Protective Gears:** village people lack protective gears during slaughtering and butchering the dead animal.

However, the in-depth analysis of quantitative and qualitative data is being undertaken and the result will be communicated in couple of months.

Deskinning of animal



Cutaneous Anthrax

Interview of Anganwadi worker

FGD In Sundargarh

Meeting with DFO, Koraput

FGD in a village in Rayagada

Interview with ANM

KAP of villagers

Local healer in Koraput

Interview of Livestock Inspector

23. Laboratory surveillance system for Antimicrobial resistance (LSSAMR)

Principal Investigators : Dr. Debdutta Bhattacharya, Scientist-C
Co-Investigator : Dr.B. Dwibedi, Scientist-E
Dr.A. S. Acharya, Scientist-C
Date of initiation : March, 2017
Duration : 3 years
Funding : ICMR Intramural

Overall objective

To study and identify the various bacterial pathogens associated with cases of diarrhoea, neonatal sepsis, urinary tract infection, typhoid in this region, and Hospital acquired infections (HAI), study their AMR pattern and to characterize the multi-drug resistant strains at molecular level.

Specific objectives

- To measure the proportion of infection caused by different bacterial pathogens in the tribal and general patients residing in the coastal and tribal region of Odisha.

- Study the aetiology of various bacterial pathogens associated with nosocomial infections
- Detect emerging resistance in this region and its spread
- To describe the clinical and epidemiological characteristics of these cases
- To study the seasonal pattern of these bacterial infection
- To describe the magnitude and quality of antibiotic use of this patient group and explore the contribution of demographic, socio-economic, healthcare-related and disease related variables to antimicrobial prescribing.
- To study the distribution of genetic markers and mechanism of development of drug resistance among these bacterial pathogens.

Hospitals to be included in the study

Tertiary hospitals under Govt. in coastal region

1. Capital Hospital, Bhubaneswar
2. Paediatric Hospital, Bhubaneswar
3. SCB Medical College, Cuttack
4. Sardar Vallabhbhai Patel Post Graduate Institute of Paediatrics (Sishubhawan), Cuttack

Study on childhood diarrhea

A total of 320 patients (<5 years of age) suffering from acute diarrhea were included in the study. Most of the cases belonged to 37-48 months' age group (30.62%) followed by 7-24 months' age group (24.37%).

Age (in months)	Male (%)	Female (%)
0-6	4 (1.25)	6 (1.87)
7-24	33 (10.31)	45 (14.06)
25-36	38 (11.87)	36 (11.25)
37-48	50 (15.62)	48 (15)
49-60	32 (10)	28 (8.75)
Total	**157 (49.06)**	**163 (50.94)**

Out of the 320 samples received and processed, eighty-two (25.6%) cases were found to be positive for enteric bacterial isolation.

Table 4: Distribution of pathogenic bacterial isolates among acute diarrhoeal cases (n=320).

Bacterial isolate	Number of isolates (%)
Diarrhoegenic *E.coli*	77(24%)
Shigella flexneri	2(0.6%)
Vibrio cholerae	2(0.6%)
Salmonella Paratyphi B	1(0.3%)

Typing of diarrhoeagenic strain of E. coli (DEC) by multiplex PCR (n=77)

Diarrhoeagenic *E. coli*	No. of diarrhoeal cases(n=77)	Percentage
Enterotoxigenic *E.coli (ETEC)*	40	51.9%
Enteropathogenic *E.coli (EPEC)*	33	42.8%
Enteroaggregative *E.coli (EAEC)*	4	5.1%

Clinical presentation associated with acute diarrhoea in children (>5 years) and its comparison with culture positive diarrhoeal cases (n=320)

Characteristics		No. of culture negative for bacterial isolates (238)	No. Of pathogenic bacterial isolates (82)	*P* value	X2
Duration of diarrhoea	<3days	61(19%)	13(4%)	0.150	3.789
	3-6days	176 (55%)	68(21.2%)		
	>6days	1(0.3%)	1(0.3%)		
Fever (>37.2˚C)		138 (43.1%)	31(9.6%)	0.0024	9.964
Vomiting		115(35.9%)	24(7.5%)	0.003	9.009
Dehydration		33(10.3%)	17(5.3%)	0.140	2.181
Anaemia		21(6.5%)	8(2.5%)	0.800	0.64
Abdominal Pain		127(39.6%)	38(11.8%)	0.273	1.203

Comparison of gross characteristic feature of stool samples among pathogenic bacterial and non-pathogenic diarrhoea(n=320).

Stool characteristics	Negative for enteric bacterial isolate (%)	Positive for enteric bacterial isolates (%)	*P* value	X2
Watery	204(63.7)	52(16.2)	0.001	18.95
Mucopurulent	26 (8.1)	25(7.8)	0.001	17.42
Bloody	8 (2.5)	5(1.5)	0.44	0.57

Antibiotic resistance pattern of the enteric bacterial isolates.

Organisms	No. (%)	AMK	CoT	IMP	TET	NAL	OFX	CTR	AMP	LEV	AMC	CIP
Diarrhoeagenic *E. coli*	77 (94)	1 (1.3)	45 (61)	2 (2.6)	18 (28.1)	77 (100)	47 (61.1)	49 (63.7)	66 (86.6)	43 (55.9)	34 (44.2)	56 (74.4)
S. flexneri	2 (2.4)	0	0	0	1 (50)	2 (100)	1 (50)	1 (50)	2 (100)	2 (100)	2 (100)	2 (100)
S.Paratyphi B	1 (1.2)	0	0	0	0	1 (100)	0	0	1 (100)	0	1 (100)	0
V.cholerae O1	2 (2.4)	0	2 (100)	1 (50)	0	2 (100)	0	0	1 (50)	1 (50)	1 (50)	1 (50)

Distribution of plasmid mediated drug resistant gene among bacterial pathogenic isolates (n=82)

Organism	No.of isolates drug resistant gene detected	Drug against which resistant gene was detected	Resistant gene
ETEC (n=40)	1	Plasmid mediated resistance against ciprofloxacin and low level resistance against aminoglycoside	*qepA* and *aac(6)-Ib-cr*
EPEC (n=33)	1	Plasmid mediated resistance against ciprofloxacin	*qepA*
EPEC (n=33)	3	Plasmid mediated **ESBL** enzyme	*CTX-M 3*
***Vibrio cholera* (n=2)**	1	**Carbapenemase** producer (plasmid or phage mediated)	*NDM 1*

Amplification of the Quinolone Resistance Determining Regions (QRDRs)

The *gyrA* (648 bp), *gyrB* (309 bp), *parC* (249 bp) and *parE* (290 bp) region were amplified by polymerase chain reaction using specific primers. The PCR product was then further confirmed by agarose electrophoresis.

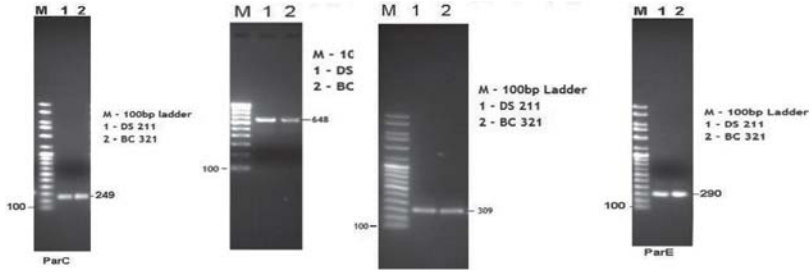


Fig.: Amplicons of QRDR regions (a) gyrA (648 bp), (b) gyrB (309 bp), (c) parC (249 bp) & (d) parE (290 bp).

Detection of mutation in QRDR region

Only 20 DEC isolates resistant to quinolones and fluoroquinolones were subjected to QRDR mutation, which include 5 NAL resistant and 15 FLQ resistant strains. Several mutations were detected in the QRDR region of the fluoroquinolone resistant *E.coli* isolates (table 18).

4.9.2 Mutations in the gyrA

Out of the 82 bacterial strains, all were only nalidixic acid resistant, 48 were fluoroquinolone resistant (at least one drug of the group in addition to NAL) and 10 were resistant to both the fluoroquinolones in addition to quinolone. All the 5 quinolone (nalidixic acid) resistant strains had a single mutation in *gyrA* at amino acid position 83 (replacement of serine with leucine). All the 15 FLQ resistant strains had double mutations at amino acid position 83 (replacement of serine with leucine) and D87N (replacement of aspartic acid with asparagine) (figure).

Mutations in the gyrB

No mutation was detected in nucleotide sequences of *gyrB* region.

Fig.: *Sequence data explorer describing the presence of single and double mutations S83L and D87N in gyrA gene of DEC strains.*

Mutations in the parC

Out of 15 FLQ resistant strains tested, eight resistant strains had a single mutation in *parC* at amino acid position S80I (replacement of serine with isoleucine) (Fig.).

Mutations in the parE

No mutation was detected in nucleotide sequences of *parE* region.

Conclusion

1. In view of findings from our study, we conclude

Fig.: Sequence data explorer describing the presence of single mutation S80I (Serine to Isoleucine) in *parC* gene of DEC strains.

Table. Mutations in the QRDR region of the DEC isolates.

Sl No.	Strain No.	ABST for Quinolone	MIC (µg/ml)			*gyrA*		*parC*	*qnrB*	*aac6'Ibcr*
			NAL	CIP	OFX	S83-L	D87-N	S80-I		
1	DEC1	NAL	128	-	-	+	-	-	-	-
2	DEC2	NAL	256	-	-	+	-	-	-	-
3	DEC3	NAL	128	-	-	+	-	-	-	-
4	DEC4	NAL	64	-	-	+	-	-	-	-
5	DEC5	NAL	128	-	-	+	-	-	-	-
6	DEC6	NAL,CIP,OFX	>256	128	32	+	+	+	-	-
7	DEC7	NAL,CIP,OFX	>256	64	64	+	+	+	-	-
8	DEC8	NAL,CIP	>256	4	-	+	+	-	-	-
9	DEC9	NAL,CIP,OFX	>256	>256	>256	+	+	+	+	+
10	DEC10	NAL,CIP,OFX	>256	64	32	+	+	+	-	-
11	DEC11	NAL,CIP, OFX	>256	32	32	+	+	+	-	-
12	DEC12	NAL,OFX	128	-	4	+	+	-	-	-
13	DEC13	NAL,CIP	64	16	-	+	+	-	-	-
14	DEC14	NAL,CIP, OFX	>256	128	32	+	+	+	-	-
15	DEC15	NAL,CIP,OFX	>256	32	32	+	+	+	-	-
16	DEC16	NAL,CIP,OFX	>256	128	128	+	+	+	-	-
17	DEC17	NAL,CIP	>256	>256	-	+	+	-	-	-
18	DEC18	NAL,OFX	>256	-	>256	+	+	-	-	-
19	DEC19	NAL,CIP	>256	128	-	+	+	-	-	-
20	DEC20	NAL,CIP	>256	64	-	+	+	-	-	-

that, Enterotoxigenic *E.coli* was the most common isolate, followed by Enteropathogenic *E.coli*, Enteroaggregative *E.coli*, *Shigella flexneri*, *Vibrio cholerae and Salmonella paratyphi B.*

2. Most of the isolates were multi-drug resistant
3. Most of the bacterial pathogen isolated were resistant to ampicillin (85.3%) followed by ciprofloxacin (70.7%), ceftriaxone (60.9%), and amoxiclav (46.3%).
4. Mutation in quinolone resistance determining region (single and double point mutation in *gyrA* and *ParC*) was detected by PCR followed by gene sequencing.
5. Drug resistance exhibited to fluoroquinolones (*qepA*, *aac(6)-Ib-cr*) and beta lactams (*CTX-M3*) drugs were both meutation as well as plasmid mediated as detected by PCR.
6. *NDM 1* gene was detected in one of the clinical isolate of *V.cholerae* O1 which is to the best of our knowledge the 1st report of *New Delhi Metallo b-lactamase* in *V.cholerae* O1.

Molecular Epidemiology of Salmonella enterica serotype Typhi and Paratyphi isolated from enteric fever in eastern Odisha.

A total of 404 blood sample was collected from suspected cases of Enteric fever were collected from SCB MCH, Cuttack and processed for conventional blood culture for identification and confirmation of the etiological agent. Out of these 404 suspected enteric fever patients, 247 (61.14%) were male and 157 (38.86%) were female.

Sex wise association of Salmonellosis in suspected enteric fever cases n=404

Groups	SALMONELLOSIS		TOTAL
	PRESENT	ABSENT	
MALE	14 (5.67%) 63.6%	233	247
FEMALE	8 (5.10) 36.4%	149	157
TOTAL	22 (5.45%) 100%	382	404

Out of 22 S.*Typhi* isolates 14 (63.6%) were from male patient with 5.67% (14 of 247) positivity and the remaining 8 (36.4%) were from female patient with 5.45% (8 of 157) positivity (P>0.05).

Age wise association of Salmonellosis in suspected enteric fever cases, n=404

GROUPS	SALMONELLOSIS		TOTAL	*p* VALUE
	PRESENT	ABSENT		
CHILDREN ≤15 YRS	10 (6.85%)	136	146 (36.13%)	0.479
ADULT ≥16 YRS	12 (4.65%)	246	258 (63.86%)	0.479
TOTAL	22	382	404 (100%)	

Twenty-two *Salmonella* (22) isolates were obtained from these 404 patients giving a proportional morbidity of 5.45% for Salmonellosis in these area. No death due to Salmonellosis occurred during the study period. Of these 22 *Salmonella* isolates all 22 (100%) were *Salmonella enterica serotype Typhi*.

Symptoms associated with the cases of suspected enteric fever (n=404)

Clinical features	No. of patients With salmonellosis (n=22)	No. of patients Without salmonellosis (n=382)	*P* VALUE	Odds ratio
FEVER>104°C	20 (90.0%)	212 (55.4%)	0.0023	8.0189
TOXEMIA	18 (81.0%)	185(48.4%)	0.0047	4.7919
ABDOMINAL PAIN	18 (81.0%)	178 (46.5%)	0.002	5.1573
HEADACHE	16 (72.7%)	176 (46.0%)	0.0267	3.1212
VOMITING	14 (63.6%)	124 (32.4%)	0.0056	3.6411
NAUSEA	18 (81.0%)	179 (46.8%)	0.0029	5.1024

Antibiotic susceptibility pattern among *S.typhi* isolates by Disc Diffusion method (n=22)

ANTIBIOTICS	RESISTANT		INTERMEDIATE		SENSITIVE	
	No OF ISOLATES	%	No OF ISOLATES	%	No OF ISOLATES	%
AMP	4	18	0	0	18	82
AMC	2	9	0	0	20	91
CAR	4	18	0	0	18	72
LEV	0	0	3	13.6	19	86.4
NAL	20	91	0	0	2	9
CIP	0	0	4	18.18	18	81.82
CoT	5	22.7	0	0	17	77.3
AZM	16	72.7	0	0	6	27.3
CHL	2	9	0	0	20	91
CFM	0	0	0	0	22	100
CTR	0	0	0	0	22	100
CAZ	0	0	8	36.36	14	63.63
CPM	0	0	0	0	0	100
CTX	0	0	6	27.27	16	72.72
IPM	0	0	0	0	22	100%
PIT	0	0	0	0	22	100%
AK	0	0	0	0	22	100%
GEN	0	0	0	0	22	100%
TET	0	0	0	0	22	100%
NOR	0	0	0	0	22	100%
NIT	0	0	0	0	22	100%

Multiple drug resistance pattern of *S.typhi* isolates (Kirby Bauer Disk Diffusion), n=22

Antibiotics	Number of isolates, (n=22)	Percentage (%)
CHL	2	9
AMP	4	18
CoT	5	22.7
NAL	20	91
AMP,COT	4	18
CHL,AMP,COT	2	9
NAL,AZM	16	72
CHL,AMP,COT,NAL,AZM	2	9

REDUCED SUCEPTIBILITY OF COMMONLY USED DRUGS FOR ENTERIC FEVER n=22

Antibiotics	No of isolates	Percentage (%)
CIPROFLOXACIN (MIC ≥0.12µg/ml)	20	91%
LEVOFLOXACIN (MIC ≥0.25µg/ml)	20	91%
CEFIXIM (MIC ≥2µg/ml)	0	0
CEFTRIAXONE (MIC ≥2µg/ml)	0	0
AZITHROMYCIN (MIC ≥16µg/ml)	16	72.7%

Detection of plasmid mediated ESBL gene among *S.typhi* isolates (n=22)

Plasmid gene	No. of *S.typhi* isolates	Positivity (%)
Bla TEM	12	54.54
Bla SHV	0	0
Bla CTX-M	4	18.18

Azithromycin MIC distribution among *S.typhi* isolates, n=22

Azithromycin MIC (µg/ml)	No. of isolates (%) n=22	Percentage (%)
6	2	9
32	10	45.45
48	4	18.18
128	2	9

Conclusion

1. In view of findings from our study, it was concluded that, *Salmonella enterica serotype Typhi* accounted for 5.45% of the suspected enteric fever cases.
2. Most of the isolates were multi-drug resistant

with rapid emergence of reduced susceptibility to fluoroquinolones.

3. 81.8% of the isolated *Salmonella typhi* strains were resistant to Azithromycin.

24. Epidemiology of Scrub Typhus in Odisha - A Pilot Study.

Principal Investigator : Dr. Madhusmita Bal, Scientist-C
Co-Invesigator(s) : Dr M R Ranjit, Dr. B Dwibedi
Collaborator (s) : DHS, Govt of Odisha, Apollo Hospital, Bhubaneswar, SCB Medical College, Cuttack, Care Hospital, Bhubaneswar, VSS Medical College& Hospital, Burla
Duration : 2 Years (2017 -2019)
Funding : ICMR Intramural

Objective

- To find out the magnitude of scrub typhus antibodies among febrile and clinically severe patients in different agro-climatic zones of Odisha
- To study the genotypes and phylogeny of *Orientia tsutsugamushi* circulating in this part of the country

Background

Scrub typhus is a re-emerging life-threatening infectious disease. It is caused by *Orientia tsutsugamushi* , an obligate intracellular Gram-negative *coccobacilli* belonging to the family *Rickettsiae*. The clinical presentation of scrub typhus varies from mild illness to severe life-threatening conditions such as meningoencephalitis, glomerulonephritis, acute renal failure (ARF), interstitial pneumonia, acute respiratory distress syndrome (ARDS), acute hepatic failure, myocarditis, pericarditis, gastrointestinal bleeding, septic shock, acute hearing loss, acute cholecystitis, intracranial hemorrhage and multiple organ involvement. It has been reported from various parts of India and accounts around 24% of all patients presenting with unexplained febrile illness. Scrub typhus is essentially an occupational disease among rural residents in the Asia-Pacific region. There are stray cases of scrub typhus have been known to be undertaken treatment in different hospitals of Bhubaneswar. However, cases of scrub typhus have not been well-documented from Odisha, an eastern Indian stat. In most cases the disease remains undiagnosed and leads to fatal consequences. In view of this the present study has been proposed which will be first systematic study and will determine the true impact of the disease in the state of Odisha, where most of the people belong agrarian community. Further genotyping of *Orientia tsutsugamushi* will provide information on potential association between strain variation and pathogenicity of scrub typhus, which may also lead to discovery of *Orientia* species other than *O. tsutsugamushi* and their actual geographic distribution. This will generate awareness among treating physicians to diagnose and institute appropriate treatment. At the same time the information will help the public health personnel to implement control measures for mites, the vectors/ reservoirs of *O. tsutsugamushi.*

Progress

A random survey was conducted among children with pyrexia of unknown origin (PUO) attending primary health care centres in 4 agro-climatic zones, during June to November 2017. Permission was obtained from the ethical committee before conducting the study. During this period we have tested a total number of 313 clinically suspected children attending primary health clinics for treatment. The inclusion criteria were patients with acute fever more than 5 days (fever < 5 days in case of

presence of eschar) negative for malaria, dengue, leptospira, typhoid and any other primary focus of infection. Rapid detection of scrub typhus was done by rapid diagnostic test detecting IgG, IgM or IgA antibodies. The test was further confirmed by quantitative IgM ELISA (In Bios International, Inc., Seattle, WA, USA) (optical density (OD) >0.5 was considered positive). Out of 313 enrolled cases from different geographical regions of the state, 135 were confirmed to be positive for scrub typhus thus the overall prevalence was 43.1%. Eschar, which is an important pathognomonic sign, was seen in 15.9% of cases. The present study shows male preponderance (male to female ratio 1.6:1) of scrub typhus infection. The age of the patients ranged from 11 weeks to 15 years and more than 50% were below 5 years. Overall (91.5%) of the positive cases belongs to rural areas. Various environmental risk factors, such as living close to forests, bushes or crop fields, cattle shed were present in 75% patients.

Future Plan

The work is on progress. More samples will be added from other regions not covered yet, genotypes of the *Orientia tsutsugamushi* will be done to find out its phylogeny and draw a phenotype –genotype relationship.

25. Acute Encephalitis Syndrome (AES) and association of immune mediator etiology.

Principal Investigator	:	Dr. Prakash Kumar Sahoo, Scientist-B
Co-Investigator(s)	:	Dr. B Dwibedi
Collaborator	:	Dr. Sib Prasad Mohanty, Asst. Professor, Dept. of Medicine, SCB Medical College, Cuttack
Duration	:	2 years (March' 2017–February' 2019)
Funding	:	ICMR-Intramural

Primary objectives:

To find out the prevalence of Encephalitis due to immune modulated etiology among Acute Encephalitis Syndrome.

Secondary objective:

To compare antibodies and cytokines response in patients of viral etiology and asymptomatic controls

Background:

Acute Encephalitis Syndrome (AES) is a group of neurologic manifestation caused by wide range of viruses, bacteria, fungi, parasites, spirochetes, chemicals and toxins. The major risk is permanent brain damage. Children aged one year or less and adults aged 55 years and over are at increased risk of life threatening complications. The main causes of viral encephalitis are: Herpes viruses, Cytomegalo virus, Epstein Barr Virus, Japanese Encephalitis (JE) virus, and Dengue Virus both are flavivirus and contribute towards the encephalitis. During the viral encephalitis diagnosis, it was observed that only 16% had a confirmed etiological agent as virus followed by bacterial, 13% had suspected etiological agent 8% had non infectious etiology (Wingfield et. al. 2011). In our centre, we found about 18-20% cases of AES are having etiology of viral infection. A large no of samples are unknown for etiological back ground. So, the line of treatment is also going as symptomatic. In this typical situation, the etiology of the infection needs to be checked for proper diagnosis and treatment.

Progress:

The project was initiated in the month of February. Samples were collected in SCB Medical College and Hospital by my collaborator. Samples were collected from patient suspected for viral encephalitis having Fever, Chills, Rigor, and Unconsciousness/Alter sensorium. Details history of the patients was collected and physical examination were done. Blood samples were collected from sixty

one patients and CSF samples were collected from 47 patients. A total of 46 paired samples (Serum and CSF) were collected from the patients. These patients were mostly from costal district of Odisha. The male (24) and female (22) individuals are in this group which is more or less equally distributed sex wise. These patients are in an age range from 6yrs to 78 yrs but the median age is 40 yrs. To compare these patients we have collected 20 no of normal individuals from Surgery and Obstetrics and Gynecology operation theatres, which were given epidural anesthesia for non-infective inervention.

Table 1: Number and percentage of patients positive for viral antibodies in blood.

Viral markers in blood	Case(n=60)		Controls(n=20)	
	Number	Percentage (%)	Number	Percentage (%)
Dengue IgM ELISA	0	0	0	0
HSV-1 IgM ELISA	7	11.67	0	0
HSV-2 IgM ELISA	4	6.67	0	0
EBV IgM ELISA	12	20	3	15
Parvo PCR	0	0	0	0

Table 2: Number and percentage of patients positive for viral antibodies in CSF.

Viral markers in CSF	Case(n=46)		Controls(n=20)	
	Number	Percentage (%)	Number	Percentage (%)
JE IgM	6	13.04	0	0
HSV-1 PCR	2	4.3	0	0

*Only three samples were positive for multiple infections both in blood and CSF.

Future Plan:

There are reports that, scrub typhus and leptospirosis infection causes AES. To rule out the possible infection of these two infections, Antibodies to scrub typhus and leptospirosis will be estimated by ELISA. Further the neural antibodies to anti-N-methyl-D-aspartic acid receptor (anti-NMDAR) and anti-voltage-gated potassium channel (anti-VGKC) which are marker of auto immune encephalitis will be estimated.

International Women's Day celebration

Flag Off Ceremony for TB Diagnostic Vans under ICMR-TIE-TB Jharkhand Project

Other Scientific Activities

1. Outbreak of cholera in Belabahali village, Keonjhar District.

Prin. Investigator : Dr. BB Pal, Sci-F

As per the available information from ADMO (PH), Keonjhar district and from media there was a diarrhoeal outbreak in Belabahali village of Andapur block on 2.5,2017. I discussed with our Director regarding its investigation. Then I myself along with S. K. Mallik(lab. attendant) proceeded toBelabahali village of Andapur Block on 2.5.2017 early morning for situation analysis, sample collection, to find out the probable source of infection and spread of diarrhoeal outbreak. After reaching at the affected village discussion was held with ADMO (PH) , Medical officer, (Anandapur SDH), paramedical staff and among the villagers regarding the incidence of diarrhoea cases, index case, location of village, drinking water sources, hygienic condition of the area etc.

About the village

The Belabahali village is located near the highway from Panikoeli- Jajpur- Anadapur- keonjhar road at the bank of Kusei river. There is a side road from the NH leading to Belabhali village, crossing the river. The total household is 892, population-6700. Ninety eight percent of the people are OBC and 2% belong to SC and general caste. The literary rate is about 50% and people are mostly businessman. The village is having 5 Sahi called as Upper sahi, Bermundasahi, Kimbhirasahi, Talasahi and Tikarsahi and all were affected due to cholera. There were few bore wells which water were rarely used by the people for cooking and drinking purposes. Due to their misbelieves that they cannot prepare rice water and these are not suitable for cooking. Few ponds were located which were used for bathing and cooking purposes. The people mainly depend on the supply water from the river which supplies water twice a day during during morning and afternoon. The pipe has been embedded in the river bed and the filter is less than four feet below from the surface of river bed. There is a well near the bank of the river and the submersible pump is inserted into the well. This well is connected to a overhead tank from which the water is being supplied to the village. But during summer the river bed was dried up and artificial sand bandha of low height was artificially made to store the flowing water. During this season the temperature is very high and there was intermittent rain fall. Due to scarcity of water the water was directly supplied to the village from the river bypassing the over head tank. As per the discussion among the villagers it was found that muddy- red colour water was supplied through the pipe during last week of April and there was leakage in the filter of the submerged pipe on the river bed. Secondly there was no chlorination done to the supplied water .This is the best evidence that the contaminated muddy water was directly supplied to the villagers which was the major source of infection.

Household Survey

After reaching the spot there was discussion among the villagers to find out the index case, total cases affected, source of infection, mode of transmission etc. The rectal swabs were collected from the diarrhoea patients from the village and also from the hospitalized patients from Anandapur SDH hospital. Similarly water samples were collected from direct supply water from different points from 5 sahi, like source point, different ponds, household water used for cooking, cleaning utensil and drinking purposes for laboratory examination.

Index case

It was found that RajaniNayak, 75yrs female from the village suffered from profuse rice water stool, vomiting, pain in abdomen on 30th April 2017 at 11pm having abdominal cramping and muscular pain .She was admitted to the hospital on 1st may 2017 at 9am early morning. She collected muddy water in day time

on 30th April and that water was used for cooking and preparing rice water and used for drinking also. She did not attend any relative's house and no relatives visited her house on the previous day who was suffering for diarrhoea. On 1.5.17 in the afternoon there was torrential rain fall starting from 2pm to 5pm in that village. Suddenly more number of cases were reported .There were 21 cases reported from 30.5. 2017 to 2.5.17 5PM..

Rectal swabs:

Total swabs collected : 20, *V. cholerae* O139 : 15, *Salmonella*spp : 1, *Shigella* spp.: 1, *E. coli* : 3

Water Samples:

One (Supply starting point) out of 11 water samples was positive for *V. cholerae* O139 sero group

Antibiogram Profile:

Sensitive: azithromycin, chloramphenicol, cotrimoxazole, ciprofloxacin, ofloxacin, doxycycline, norfloxacin, tetracycline, trimethoprim and gentamicin.

Resistance: ampicilin and streptomycin.

2. In-silico identification of novel drug target(s) and OMICs studies to discover potent inhibitors against superbug Pseudomonas aeruginosa.

Principal investigator	:	Dr. G. R Dwivedi, Sci.-C
Cllaborator(s)	:	CSIR-CIMAP, Lucknow.
Duration	:	2015-2018 (In RMRC 2017-2018)
Funding	:	SERB, Science and Engineering Research Board, New Delhi

Objectives of the proposed project

1. *In-silico*genomic/proteomic analysis of human and *Pseudomonas aeruginosa* in order to identify novel drug target(s).
2. In addition to novel drug targets some known drug targets responsible for multidrug resistance and pathogenesis will also be analyzed in *P. aeruginosa*.
3. Nearly 500 clinical isolates shall be procured to find out the key patterns of resistance and pathogenesis in north India.
4. Correlation among the different mechanisms of resistance and pathogenesis will be worked out.
5. Expression and proteomic based bioassays for the identification of novel inhibitors against *P. aeruginosa* and their possible validation.

Background

Pseudomonas aeruginosa is one of the most formidable pathogen found in the hospital setting and involved in a variety of human infections (Breidenstein *et al*., 2011). This pathogen is the cause of 17% of healthcare-associated pneumonia and is the most common pathogen in late onset ventilator associated pneumonia, in addition to causing infections in neutropenic hosts and being responsible for pulmonary infections in patients with cystic fibrosis.. *P. aeruginosa* is the seventh most common organism found in bloodstream infections. Multitude of virulence factors, an expanding number of resistance determinants for example, efflux pumps (mexAB), porin mutations (oprD), production of inducible AmpC, extended spectrum (PER and OXA) and metallo-β-lactamases (IMP and VIM), and the biofilms made *P. aeruginosa* the worst nightmare.The proposed work has been conceptualized in the backdrop of present scenario and aims to investigate the novel drug target(s)/drugs as well as the different mechanisms responsible for emergence of multi drug resistance such as production of metallo-β-lactamases and AmpC, over expression of efflux systems, porin down regulation and biofilms formations among *P. aeruginosa* clinical isolates. The present study will help to find out the key mechanisms of multi drug

resistance and identify novel inhibitors that can block MDR mechanism in *P. aeruginosa*.

Progress

The bioinformatics analysis of P. aeruginosa proteome has revealed that among 5572 proteins, majority are unknown/hypothetical proteins followed by proteins involved in metabolism. It was observed that about 8% proteome are involved in the transportation. Among these transporter proteins, abundance of secondary transporters was observed followed by ATP dependent transporters, phosphotransferase system and ion channels. RND efflux pump transporters were found to have major role in multidrug resistance, biofilm synthesis regulations and the drug transporter proteins. The RND families of transporters are known to be specific to gram negative bacteria. Thus, the RND multi drug efflux pump proteins were selected for further studies in P. aeruginosa. Among transporter proteins, 29 RND transporters and 3 porin proteins were analyzed. The porin proteins are crucial for tripartite complex with RND proteins. Out of 29, 12 RND proteins were found to be acting as fusion proteins while remaining 17 as RND efflux transporters.

MexA-MexB-OprM efflux pump protein complex was selected for further in silico molecular docking and ADME analysis with five different groups of efflux pump inhibitors. In silico molecular docking of efflux pump proteins namely MexA, MexB and OprM with Catharanthin, Glycyrrhetinic acid derivatives, curumin derivatives, citral, phenyl arginine β-napthalmide (PAβN), carbonyl cyanide m-chlorophenylhydrazone (CCCP), reserpine and ouabain. Further, the drug likeliness of the compounds studied through in silico ADME analyses indicated that PaβN had better HIA, high BBB penetration and was a non-inhibitor of cytochrome P450 (CYP2D6). The aqueous solubility and plasma protein binding capacity of these compounds were more or less same, indicating us drug likeliness of PaβN.

During mean time, the about 350 clinical isolates were procured from KGMU and SGPGI, Lucknow, among them MDR clinical isolates were sorted out. Eighty plant based compounds were screened against these MDR and sensitive strains. The mechanisms of the drug resistance reversal potential of these compounds were also evaluated and Catharanthin, Glycyrrhetinic acid derivatives, curumin derivatives and PAβN were found good efflux pump inhibitors. Four research papers and one book chapter were conceptualized and communicated to reputed journals.

A review, book chapters and 2 research papers were also conceptualized in the backdrop of present scenario and aims to investigate the key mechanisms responsible for emergence of superbugs/MDR such as production of metallo-β-lactamases and AmpC, over expression of efflux systems, porin down regulation and biofilms formations among Gram-negative bacteria and published in International SCI journals.

These plant compounds Inhibition of these key mechanisms by these plant compounds may be useful in: (i) Lowering the dose of antibiotics (ii) reducing the drug resistance development frequency and (iii) increasing the efficacy of antibiotics against superbug/MDR strains. In this regard, these plant based compounds will be promising warheads against bacterial resistance. We have to work hard to make our next generation safe till that we will follow the slogan "right drug, right dose and right duration".

Completed Studies

Contents

1. Distribution and bionomics of *Culex 'vishnui'* group of mosquitoes with reference to Japanese Encephalitis transmission in Odisha.

Principal Investigator : Dr. Namita Mahapatra
Co-Investigators : Dr.R.K.Hazra, Mr.N.S.Marai
Dt of commencement : 01/09/2015
Date of completion : 31/08/2017
Funding : Extramural (ICMR)

Objectives as approved:

1. To map the adult and larval distribution of *Culex 'vishnui'* group of mosquitoes in JE affected areas of Odisha.
2. To study the adult density, seasonal prevalence, gonotrophic cycle, resting, biting, breeding behaviour and susceptibility status to insecticides used in the programme.
3. To find out the presence of virus in mosquito vector, pig and human population in the affected areas.

Background:

Japanese encephalitis (JE) has been a serious public health problem in Odisha since 2013. During the last two years, outbreak of Japanese Encephalitis occurred in three different geo -physiographical region of the state i.e., Malkangiri (Eastern Ghat), Jajpur (Coastal belt), Keonjhar and Mayurbhanj districts (Northern plateau). Entomological studies were undertaken during the outbreak occurred at Malkangiri in December 2012, at Keonjhar in March 2014 and at Jajpur in November 2014. However no systematic study has been done on distribution, biology and transmission potentiality of the vector Cx. vishnui group of mosquitoes for developing control strategy. The present study entitled "Distribution and bionomics of Culex 'vishnui' group of mosquitoes with reference to Japanese Encephalitis transmission in Odisha" was initiated on September 2015 and findings of the outbreak studies before initiation of this one year study (Sep 2015 to Aug 2016) has also been present in the report. During the study period there were two outbreaks in October 2015 at Mayurbhanj district (Northern plateau) and in the Puri district (coastal belt) in the month of June 2016 just before cart festival. The findings of the entomological survey were also included in the present report.

Fig 1. Map of Odisha with JE outbreak reported districts.

Baseline Entomological and epidemiological data obtained during the outbreak of JE in 2013 and 2014 before initiation of the current project.

JE Transmission in Malkangiri district during 2013

A total of 45 blood samples were collected from the members of the affected household (contacts) as well as neighbors in the presence of the PHC doctor. 5 samples were also collected from the hospital who had fever and suspected to have malaria. The samples were brought to the laboratory to detect IgM and IgG. Twelve samples were found to be positive for JEV infection.

Following the JE outbreak, an entomological survey was also conducted to find out the possibility of JE transmission; the team went to the affected villages and collected mosquitoes.

Blood samples collection from Pigs

It was observed that, pigsty were adjacent to household (Fig.2, Situation 1). The affected households

were identified and blood samples were taken from the pigs (Amplifying host) by the expert veterinary surgeon. The pigs were given identifying marks by the, detail of the pig like their age, sex, colour, and health profile were recorded along with their owner's name. The blood samples were brought to the Malkangiri hospital where serum were separated after centrifuge, then serum were brought to the RMRC lab and subsequently sent to NIV Pune. The result showed out of 45 samples 5 were found positive for IgG (Communicated by NIV, Pune).

Entomological survey

Adult mosquito collections were done from indoor and outdoor of the household. Collected mosquitoes were brought to Malkangiri and were identified. The detail of vector prevalence has been depicted in.

Fig 2. Pig sty adjacent to the house

Fig 3. Collection of blood from the pig

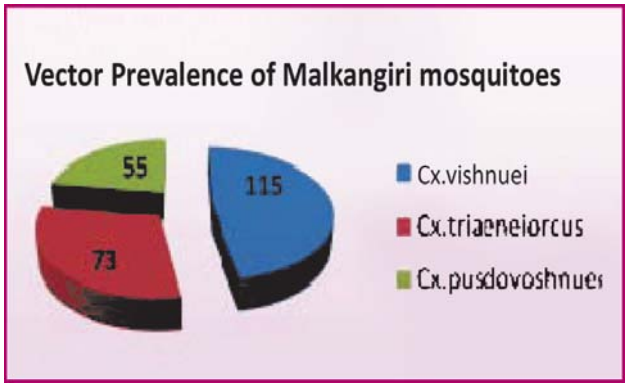


Fig 4. Vector prevalence of Malkangiri mosquitoes

The identified mosquitoes were kept in -20°C. 10 pools of *Cx.vishnuei* group of mosquitoes were processed for detection of virus by PCR method. Each pool contained 25 mosquitoes. 3pools were found to be positive for JEV infection. Larval collections were carried out in 80 rice field, 23 pools, two ponds, Larvae were brought to RMRC lab, reared and after adult emergence and identification was done. The data showed rice fields are the most potential breeding site of the vector.

JE Transmission in Keonjhar district during 2014

A total of 79 blood and three CSF samples were collected from the affected area. Out of these 79 samples 61 were from Swampatna village of Patna block. Rest, eighteen samples were from Dehuriposi village of Ghatgaon block. Fourteen samples (14) were positive for IgM (12 from Patna and 2 from Ghatgaon block).

Entomological survey revealed the presence of *Cx.vishnui* group of mosquitoes along with *An.subpictus, An.vagus, An. culicifacies, An. fluviatilis and Mansonia uniformis.* A total of 367 *Cx.vishnui* groups of mosquitoes were collected and they were processed for detection of JEV virus. Entomological investigation such as seasonal variation of vector population, resting and feeding behaviour and human blood index were also calculated and virus was detected in one specimen of *Cx.vishnui* by RT-PCR method. The study is in

progress to find out the transmission pattern of virus during inter epidemic situation.

Larval collection

Larval collections were carried out from paddy fields, tanks, ponds, puddles, ditches, ground pools etc. The larval density was calculated as the average number of immature per dip collected from each habitat. Larval counts were made carefully and the identification of species done by following standard keys (Barraud, 1934; Sirivanakarn, 1976; Reuben, 1968). Third instars larvae were taken for categorization and reared until adult emergence for further confirmation of the species.

Location of pig herd

In contrast to Malkangiri it was observed that the pigs were not found in the affected villages but some tribal's were having herd of pigs in the forested areas which were 3 to 5 km away from the affected village (Fig 5. Situation 2) .Interestingly these pigs come to the village area for feeding purpose in the morning and went back to their habitats in the evening and mosquito which bites them during the day, bites the human being during dusk as a result JE transmission occur in host area.

In some of the affected village it was seen most of the houses have pig shed within 5 to 50 meters away from the house (Fig 6. Situation1). The above finding suggest in the situation-1 human vaccination/vector control can curtail the diseases transmission. Whereas, in situation 2, vaccination of the pigs will be helpful in controlling the transmission.

Fig 5. Pig population staying far away from the affected village of Keonjhar

Fig 6. Pig and piglet of Keonjhar staying adjacent of the house

Jajpur

After receiving death report from the CDMO Jajpur a team of Doctors & Medical Entomology had visited the affected villages Mathurapur of Jajpur. Out of 36 blood samples 12 were positive for JEV. Mosquitoes and larval collection was done month wise in that affected areas of villages Mathurapur & adjacent village Mukundapur. More than 150 HH were surveyed for mosquito collection from the affected villages. More than 1314 different types of mosquito species like *Cx.triaeniorhynchus, Cx.vishnui gr. Cx.gelidus, Cx.quinquefasciatus, Cx.bitaenearhynehus An.culicifascies, An.varuna, An.vagus, Armigerius, An.annularis, An.culicifacies, Ma.uniformis, Ma.indiana* and *Ae.vittatus* were collected. The mosquitoes were brought to the laboratory and were processed for detection of JE virus.

Out of 1314 samples 100 samples of *Cx. vishnui* gr. in 4 pools have been processed by RT-PCR method. Each pool contains 25 mosquitoes. Out of 4 pools one pool was found positive for JEV.

Location of pig herd

A pig shelter at solopatta village which is about 2-3 km. away from the affected village (Mathurapur) was located and their details were collected. More than 40 numbers of pigs in herd were permanently staying there. The owner of pig were leading two types of life i.e they used to keep the pigs in the shelter and also some time they keep them in open near the river bed just 1.5 km away from the affected village Mathurapur.

Longitudinal studies were carried out in Keonjhar and Jajpur and recently outbreak occurred at Mayurbhanj and Puri district were also included in this study period. The details data were given below.

Mayurbhanj

Around 215 Adult mosquitoes were collected from Mayurbhanja area for detection of Japanese encephalitis virus. Among them 185 were *An.hyrcanus*, 28 were *Culex vishnui*, one specimen was *Culex gelidus* and 2 were *Ma.uniformis*. We processed 80 samples, out of which two samples were positive for *Cx.vishnui* and one *for Cx.gelidus*.

Puri

During the month of June 2016, JE outbreak was reported in Puri district and prolonged up to September. Age wise analysis revealed that the maximum number of cases occurred in children aged between 6-10 years. In Puri district PMHD of *Cx.vishnui* was high (66.4) during outbreak of JE in summer season (2016) and out of 41 pools, 1 pool of *Culex vishnui* group was found positive for JE virus.

Fig 7. Collection of Mosquitoes and blood samples from the community

Table 1. Total no. of adult mosquitoes collected at dawn and dusk hour from animal shed and human dwelling of different districts (Odisha) during September 2015 to August 2016.

Sl. No	Species	Keonjhar	Mayurbhanj	Jajpur	Puri	Total	Species Composition (%)
1	*An.annularis*	282	100	71	1	454	6.02
2	*An.aconitus*	272	12	2	0	286	3.79
3	*An. barbirostris*	51	23	75	10	159	2.11
4	*An.culicifacies*	16	7	29	0	52	0.69
5	*An.fluviatilis*	5	0	0	0	5	0.06
6	*An.hyrcanus*	34	2	130	0	166	2.20
7	*An.jamsei*	5	0	0	0	5	0.06
8	*An.karwari*	2	0	0	0	2	0.02
9	*An.subpictus*	3	0	4	11	18	0.23
10	*An.vagus*	33	8	102	7	150	1.99
11	*Ma.uniformis*	15	5	268	45	333	4.42
12	*Ma.indiana*	1	0	0	0	1	0.01
13	*Ma.annulifera*	5	32	25	4	66	0.87
14	*Cx .vishnui*	724	422	1435	2152	4733	62.83
15	*Cx .tritaeniorhynchus*	153	60	206	211	630	8.36
16	*Cx .quinquefasciatus*	32	102	188	32	354	4.69
17	*Cx .gelidus*	4	2	21	7	34	0.45
18	*Cx .luchia*	5	1	4	0	10	0.13
19	*Armigeres*	8	7	40	19	74	0.98
	Grand Total	**1650**	**783**	**2600**	**2499**	**7532**	**100**

Seasonal Prevalence of JE vectors (*Cx.vishnui* group**)**

Entomological Observation (from Sep 2015 to Aug 2016)

Adult Mosquito Collection and Composition

A total of 6508 mosquitoes collected at dawn and dusk hours belonged to 4 genera and 19 species including 7 species which are known to be JE vectors in India. Among 19 species Cx. *vishnui* was the predominant species (62.83%) followed by, *Cx. tritaeniorhynchus(8.36%) An.annularis* (6.02%), *Cx. quinquefasciatus* (4.69%), *Ma.uniformis* (4.42%), *An.aconitus* (3.79%), *An.hyrcanus* (2.2%) *and An. barbirostris* (2.11%). The remaining 12 species, which formed 6.7 percent of the total catches were *An.culicifacies*, *An. fluviatilis*, *An. jamsei*, *An.karwari*, *An. subpictus*, *An. vagus*, *Ma.indiana*, *Ma. annulifera*, *Cx. gelidus*, *Cx. luchia* and *Armigeres* details are given below in the Table 1.

The seasonal distribution of vector mosquitoes varies in time and space depending upon

environmental conditions and availability of breeding habitats. The details of the seasonal prevalence were shown in the Fig 8. The highest PMHD of *Cx.vishnui* was observed in rainy season when compared with other two seasons in Jajpur and Keonjhar districts (regular study area) whereas in Puri district PMHD of *Cx.vishnui* was high during outbreak of JE in summer season (2016).

Larval Survey

In the study sites, four different types of mosquito breeding habitats (Irrigation channels, ponds, rice fields and pools) were examined for larval breeding during September 2015 to August 2016. By using dipping method, collected data were analyzed to calculate larval density. Details were given in the Table 2.

The per dip density of larvae of *Cx.vishnui gr.* was 24.28 in rice field followed by 23.21 in irrigation channel, 21.66 in ponds and 18.40 in pools in Jajpur whereas in Keonjhar the per dip density of larvae of *Cx.vishnui gr.* was 12.2 in rice field followed by 11.12 in ponds, 9.45 in irrigation channel and 8.9 in pools. The density of mosquito larvae were recorded from different breeding sites and maintained at rearing laboratory for further research work. The species emerged from the immature samples included *Cx.vishnui*, *Cx. tritaeniorhynchus* and *Cx.pseudovishnui*.

Blood meal identification

Around 165 blood meals of Cx vishnui group were collected and processed by gel diffusion technique for blood meal identification. Anthropophilic index was very low (7.8%) and only two blood meals were positive for pig blood only.

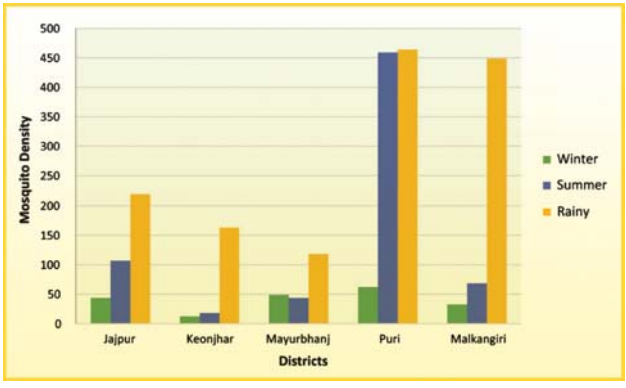


Fig 8. Seasonal prevalence of *Culex vishnui* group in different study areas of Odisha.

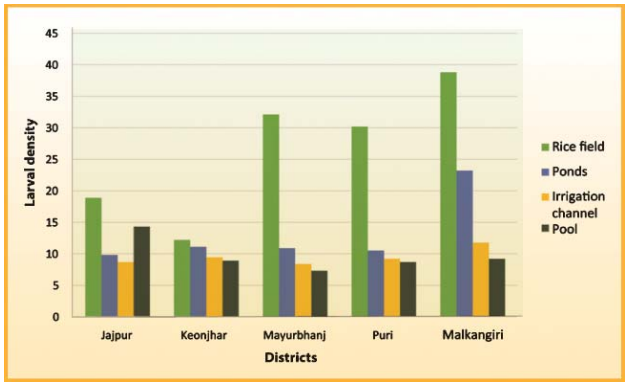


Fig 9. Larval density of *Culex vishnui* group in different breeding sites in the study areas.

Table 2. The density of mosquito larvae recorded from different breeding sites from two districts of Odisha.

Mosquito Species	JAJPUR				KEONJHAR			
	Different type of Larval Breeding Sites							
	Rice Field	Ponds	Pools	Irrigation channels	Rice Field	Ponds	Pools	Irrigation channels
Cx.vishnui group(No. of **B** larvae per dip)	24.28	21.66	18.40	23.21	12.2	11.12	8.9	9.45

Epidemiological Features

A total of 316 JE suspected cases were reported from the study area i.e. five districts (Malkangiri, Jajpur, Mayurbhanja, Keonjhar and Puri) of Odisha. Details of the suspected cases and JE positive cases were given below in the Table 3.

Susceptibility Status

The susceptibility status of *Cx vishnui* was studied by using standard WHO method. The species were found to be resistant to DDT and susceptible to pyrethroids.

The maximum no of cases (123) were registered in 2016 JE outbreak in Puri district. Brahmagiri block was the worst affected and maximum no of cases were reported from these areas .Out of 123 JE suspected cases 51 showed positive results for JE infection.

Generally the outbreaks were reported from various districts between August to November with a peak in October. But during 2016 outbreak occurred in Puri, JE cases were reported from June to September. Out of 26 pools three pools showed positive result one from Jajpur i.e., *Culex vishnui* group and two pools from Mayurbhanja district i.e. *Culex vishnui* group and *Culex gelidus.*

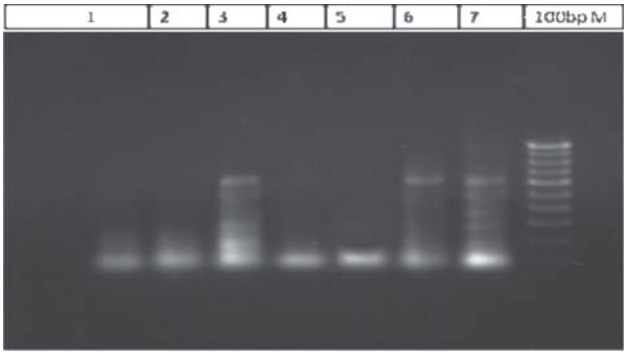
Detection of JEV Antigen in mosquito by MAC ELISA Kit (NIV, Pune)

Monoclonal antibody based antigen capture ELISA kit was used for detection of JEV from mosquito developed by NIV Pune (ICMR Annual Report 2014-15: 18). The hybridoma cell line producing antibody against JEV is unique and the monoclonal antibody is highly specific. Due to the high specificity and reproducibility the kit was used.

Table3. Epidemiological Data of JE cases during the outbreak occurred in Odisha.

Study Area (District)	Year of outbreak	Total no of suspected human blood samples	JE positive case (IgM positive)
Malkangiri	2012	45	12
	2016	180	61
Jajpur	2014	36	12
Keonjhar	2014	79	14
Mayurbhanja	2015	42	16
Puri	2016	123	51

A total of 4010 numbers of wild caught mosquitoes were sexed and pooled. The pools were homogenized with the diluents and centrifuged. The supernatant was subjected to ELISA for the detection of virus. Virus specific monoclonal antibody coated on the ELISA plate capture the virus antigen from the mosquito suspension. Another monoclonal antibody (usually against another epitope of the virus) would bind with the captured virus and forms a sandwich. The binding of the second antibody would be detected by a secondary antibody tagged with enzyme



Lane1- An.hyrcanus (Hy1), **Lane 2-** An.hyrcanus (Hy2), **Lane 3-** Cx. vishnui (CV1), **Lane 4-** Ma.uniformis, **Lane5-** Cx.vishnui (CV (1), **Lane 6-** Cx.vishnui (CV (II), **Lane 7-** Cx.gelidus.

Fig.-9: Gel picture showing the expected DNA product at 554 bp.

conjugate. Addition of a substrate would exhibit a colorful reaction and could be read visually.

1. Detailed analysis of the results.

Out of 4010 mosquitoes, 3600 mosquitoes were processed in pool basis (each pool contains 50 specimens) by JE antigen captured ELISA kit. Out of 72 pools, 1 pool of Culex vishnui group was found positive for JE virus from Puri district during JE outbreak in 2016. Details of ELISA plate reading at 450 nm were given below and the results were sent to NIV, Pune for confirmation.

PC -Positive Control, NC - Negative Control, MPC-Mosquito Positive Control, MNC-Mosquito Negative Control, TS - Test Sample (Field Collected Sample), S1, S2, S3, S4- NIV Pune Sample.

2. Contributions made towards increasing the state of knowledge in the subject.

MIR of *Cx.vishnui* was found to be 12 in Malkangiri, 10 in Jajpur, 2.72 in Keonjhar, 3.10 in Mayurbhanj and 0.48 in Puri during outbreak at different districts from Odisha. From our study and the above result of MIR showed that there is an active

Table 4. Detection of JEV antigen in *Cx. vishnui* group of mosquitoes.

	1	2	3	4	5	6	7	8	9	10	11	12
A	PC	TS	PC	TS	TS	TS	PC	TS (+ve)	TS	TS	PC	TS
	2.102	0.15	1.896	0.169	0.172	0.189	1.598	0.579	0.141	0.197	1.135	0.039
B	NC	TS	NC	TS	TS	TS	NC	TS	TS	TS	NC	TS
	0.199	0.142	0.189	0.175	0.165	0.205	0.182	0.158	0.109	0.149	0.092	0.038
C	MPC	TS	MPC	TS	TS	TS	MPC	TS	TS	TS	MPC	TS
	0.757	0.159	0.576	0.146	0.193	0.144	0.588	0.149	0.324	0.125	0.401	0.119
D	MNC	TS	MNC	TS	TS	TS	MNC	TS	TS	TS	MNC	TS
	0.192	0.146	0.185	0.162	0.154	0.154	0.128	0.282	0.106	0.183	0.099	0.093
E	TS	TS	TS	TS	TS	TS	S1	TS	TS	TS	S1	TS
	0.141	0.141	0.159	0.171	0.125	0.149	0.192	0.105	0.152	0.205	0.093	0.038
F	TS	TS	TS	TS	TS	TS	S2	TS	TS	TS	S2	TS
	0.156	0.155	0.147	0.138	0.138	0.172	0.413	0.127	0.199	0.163	0.128	0.05
G	TS	TS	TS	TS	TS	TS	S3	TS	TS	TS	S3	TS
	0.162	0.208	0.178	0.232	0.183	0.198	2.004	0.138	0.151	0.161	1.401	0.046
H	TS	TS	TS	TS	TS	TS	S4	TS	TS	TS	S4	TS
	0.14	0.152	0.161	0.147	0.142	0.183	0.907	0.167	0.213	0.211	0.739	0.037

PC -Positive Control, MPC-Mosquito Positive Control, NC - Negative Control, MNC-Mosquito Negative Control, S1, S2, S3, S4- NIV Pune Sample.

transmission is going on in these areas (Malkangiri, Jajpur, Mayurbhanj and Puri). So the government of Odisha has implemented **vaccine programme** on these affected districts.

3. Conclusions summarizing the achievements and indication of scope for future work.

Further work will be continued to find out the transmission pattern and circulation of JEV during inter epidemic period and role of other mosquitoes in the transmission, GIS mapping of the vector and their distribution and study on the insecticide susceptibility status has also been initiated. Transovarial transmission needs to be studied in the affected areas.

2. Improving Health of under five children in Rayagada Dist, Odisha.

Principal Investigator : Dr MR Ranjit
Duration : 3 years
Starting Date : 1st March 2014
Date of completion : 28th Feb 2017
Funding : ICMR Tribal Task Force

Background

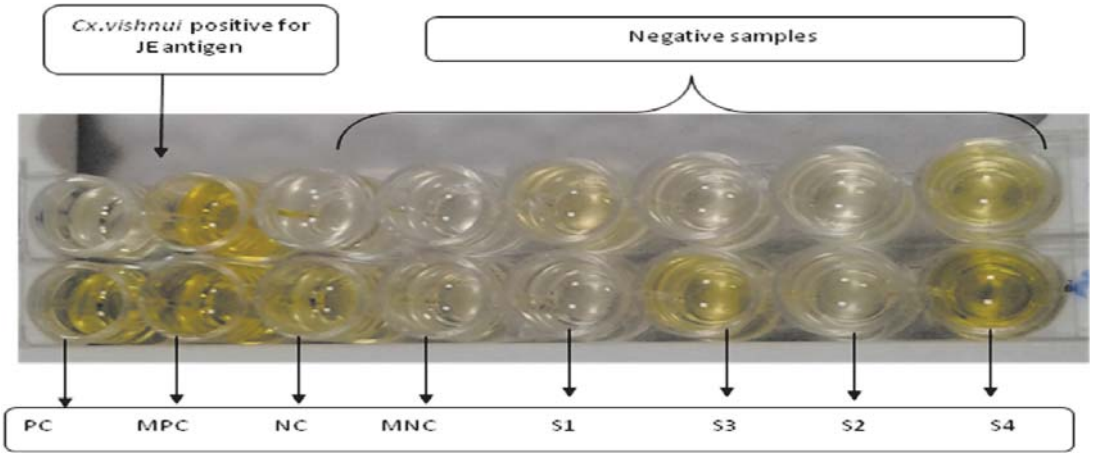
Rayagada district is located between 82^0 54′ to 82^0 2′ east longitude and between 19^0 0′ to 19^0 58′ north latitude. The total geographical area of the district is 7,584.7km^2. As per the 2011 census the total population of the district is 961,959 and 55.8% of them belongs to scheduled tribes. The population of children up to the age of 5 years is 14.67% and the child sex ratio is 955 females per thousand males. As per the Annual Health Survey Report 2011-12 the IMR in Raygada is 61 and U5CMR is 103, while in Odisha it is 59 and 79 respectively. The present activity has been planned in the context of the MOA reached between Government of Odisha to improve the health parameters of under 5 children with special reference to reduction of morbidity and mortality (prenatal, perinatal, childhood mortality and MMR) through health system strengthening using innovative approaches.

Objectives

(i) To train and improve the skills of grass root level health workers for early detection, management and referral of diarrheal diseases, acute respiratory infections (pneumonia), malaria, measles, diphtheria and under-nutrition

(ii) To develop communication strategy for effective delivery of family and community interventions

(iii) To educate and create awareness among the



PC -Positive Control, MPC-Mosquito Positive Control, NC - Negative Control, MNC-Mosquito Negative Control, S1, S2, S3, S4- NIV Pune Sample.

Fig 10. ELISA plate showing visual positive mosquito sample for JEV.

community on the preventive health care related to diarrheal diseases, acute respiratory infections, malaria, diphtheria, measles and under-nutrition through innovative approach and increase health seeking behavior

(iv) To strengthen the maternal and child health services (antenatal checkup, institutional delivery, puerperal care and neonatal care) undertaken by the programme (RCH III)

(v) To strengthen health management information system (HMIS) for effective monitoring and evaluation.

(vi) To improve the procurement and flow of logistics relevant to MCH services

Progress of work

Study Area

(A) Intervention area: Jagannathpur and Putasing Sectors of **Gunupur block** and Sectors of **Jamadeipentha /Raygada block**

(B) Control area: Therubali and Rekhapadar sectors of **Kolnara block** and Kashipur and Tikiri sectors of **Kashipur block**

During the period under report the interim evaluation was done to find out the impact of the intervention. The impact has been assessed based on the base line data generated by the Investigators as reported in the previous Annual report (2015 and 2016)

A. Interim Evaluation

An interim survey was conducted after two years (from during Oct 2016 to Feb17) to evaluate the outcome of intevention in the study area compared to control area. A door to door survey was conducted in the same 112 villages where baseline survey was conducted of the selected sub centers using a pre-designed proforma in local language. Infants born to mothers during the survey period were enrolled for the study through anganwadi registers. Each mother was interviewed for about 40 minutes. Mothers were informed through phone prior to each visit to be available in the houses and then house to house visit was done. Information about delivery and feeding practices, occurrence and management of any childhood illness, immunisation, children/ adult habituated to hand wash practice, use of safe drinking water, use of LLIN and utilisation of health services were collected. General examination was done to all infants and under 5 children. The mean weight and height of children were computed to age and gender and compared with median value of WHO reference values or growth standards to assess the nutritional status of the children. To assess the skill development of the grass root level health care providers, a survey was conducted using pre tested semi structured questionnaire. The procurement and logistic supply was caluclated based on the availbiity of the drugs in stock register and improvement in the HIMS was assesed based on the reports of the ASHA/AWW to and subsequently the weekly reports of the ANM/ MPHW to health supervisor.

A.1: Improvement in the Skills of grass root health care providers.

Total 295 (ASHA: 163 and AWW: 132) grass root level health providers and 26 community volunteers were interviewed to assess the improvement in their skill. It was observed that the skill of the ASHA/AWW and Community Volunteers on severity assessment and referral of patients to the PHC/CHC or Hospital of the disease included in IMNCI programme have been singnificantly improved after two rounds (6 hours each) of intensive trainings using IMNCI material support (IMNCI chart booklet prepared by

RMRC) on TOT mode as per IMNCI guideline of 2013 and supportive supervision provided every month to ensure implementation of the program according to IMNCI strategy in the interventiona area. The results of the assessment have been depicted in the Table A.1. On comparison it was found that the improvement in the study area is highly significant ($P < 0.001$) than the control area during this period of intervention.

A.2 Development of communication strategy

The school children, self help group (SHG) and community volunteers were chosen to spread the message on IMNCI and MCH services / practices including hygiene practice and utilization of health services. In each school we have introduced a ***"Thought of the Day"*** discussion session for 10 minutes after the prayer everyday on hand wash practice, use of mosquito net, use of toilet and seeking of treatment at hospital for any ailment by the family members. The SHG and community volunteers spread the message through one to one to contact during social gatherings and meetings. The IEC materials for community awareness have been developed through PLA.

A.3 Creation of Awareness in the community

The BCC activities were undertaken through PLA, FGD, demonstration in the school/ angawadi centre, one act play in weekly village market, distribution of leaflets and one to one interaction at village level on the diagnosis, prevention and treatment of IMNCI related diseases.

Table A.1: Skill assessment of ASHA/AWW on disease management before and after intervention.

Disease/ Knowledge	Before Training		After Training /re-orientaion		Proportion T –test
	Study	Control	Study	Control	BT vs AT
Malaria					
• Correct symptoms	63.2%	61.9%	88.7%	62.9%	P<0.05
• Correct management	41.6%	43.4%	69.3%	44.8%	P<0.001
• Decision on danger signs	10.2%	10.2%	35.9%	10.9%	P<0.001
• Steps of RDT use	58.1%	59.7%	75.8%	60.1%	P<0.05
ARI					
• Fast breathing criteria	10.2% (AWW) and 4.0 %(ASHA) 11.4% (AWW) and 4% (ASHA)		40.2 %(AWW) and 24.0 %(ASHA) 12.9% (AWW) and 5.1% (ASHA)		P<0.05
• Management of ARI serious illness					P<0.001
• Mild illness management	11.6%	12.6%	41.8%	12.6%	P<0.001
• Breathing rate	10.9%	11.8%	50.8%	12.9%	
	0.0%	0.0%	15.1%	1.0%	
Diarrhea					
• Correct symptom/sign	15.1%	16.3%	59.8%	21.0%	P<0.001
• Use of ORS					P<0.001
• Severe sign	12.4%	12.2%	70.6%	19.6%	P<0.001
• Refrral	0.0%	0.0%	12.5%	1.1%	P<0.001
	0.0%	0.0%	45.9%	1.6%	
Nutrition					
• Frequency of breast feeding	19.7%	21.1%	40.0%	23.3%	P<0.001
• Immunization schedule					
• Vit A supplementation	41.6%	45.7%	77.3%	51.1%	P<0.001
• Extra calorie food during pregnancy	11.0%	11.8%	51.8%	18.9%	P<0.001
	10.0%	10.1%	52.1%	15.7%	P<0.001

A.3.1 ***Perception on hygiene practice***

Improvement in personal hygeine and preventive health practices & knowledge in the school going chilldren and community during the post intevention period are depicted in the following tables. When compared with the base line data the improvement in the perception of hygiene practice and use of LLIN to prevent malaria has been found to increase in study area than control area Table A.2.

A.3.2 ***Community perception about vaccination***

An interview was conducted taking 1012 mothers to know about their knowledge immunization it was observed that around >65 % of the mothers now know at least some aspects of immunization after awareness creation against 50% initially in the study area (Table A.3), while no significant change (Pre: 56% vs Post: 58%) was observed in the control area.

A.3.3 ***Perception about the complications and immediate treatment.***

During interim evaluation a total 160 (100 female and 60 male) individuals interviewed randomly it was observed that there is a significant improvement in the perception of the community on not able to breast fed, Sick child, Fever, Fast breathing, Difficulty in breathing, Dysentery, Drinking poorly, Diarrhea and

Table A.2 : Practice of hand wash and use of safe drinking water/LLIN/ health system.

Indicators	Before Intervention ControlArea	Study Area	Proportion T –test CA vsSA	After Intervention Control Area	Study Area	Proportion T –test CA vsSA
Proportion of children habituated to handwash	31%	28%	P>0.05	34%	42%	P<0.05
Proportion of adult habituated to handwash	27%	28%	P>0.05	31%	42%	P<0.05
Proportion using safe drinking water	35%	37%	P>0.05	37%	48%	P<0.05
Proportion using LLIN	4%	3%	P>0.05	5%	7%	P>0.05
Proportion using Health system	56%	54%	P>0.05	61%	65%	P>0.05

Table A-3: Awareness among mothers on immunization program.

Mother of children awareness of mother		Vaccination to be given in a national immunization day?	BCG vaccination against Tuberculosis is an injection in the left shoulder that caused a scar?	Vaccination injections given in the thigh/buttocks to prevent from getting tetanus, whooping cough, diphtheria	Vaccination injection shot in the arm at the age of 9 months or older - to prevent him/her from getting measles?
Age group	Number				
0-1 Year	201	102	149	156	74
1-2 Year	300	92	143	187	154
2-5 Year	511	237	488	438	392
Total	1012	431 (42.6%)	780 (77.1%)	781 (77.2%)	620 (61.3%)

vomiting are danger signs of some diseases and they need immediate treatment after creation of awareness through PLA (Table A.4). This shows a significant improvement (P<0.001) in the perception of the community on disease complications and treatment compared to pre-intervention data.

A.4: Strengthening MCH services by community participation.

A volunteer was recruited from among the Self Help Group (SHG) members in each village with some level of education and leadership skills, preferably married with children. Her role was to conduct meetings with women regularly during the Village Health and Nutrition Day(VHND) for providing them with information on need and benefits of antenatal, delivering in a health facility and newborn care and create local awreness through participatory approach, attend planning and supervision meetings of Gaon Kalyan Samaiti (GKS) and support group action. Each step of the volunteer was supported by health supervisors(ANM/ MPHW). Though there were no substantial effects on health care, but women in intervention areas reported fewer sentinel antenatal morbidities, higher institutional deliveries and good new borne care practice etc. Severe cases of diarrhea, ARI, malaria and under nutrition requiring doctor's advice or hospitalization was a problem in the study area. It was discussed in the village level community meetings with Gram Kalyan Samiti (GKS) members, Self Help Groups (SHGs) and ward members, for use of GKS fund for this purpose (local transportation). It was consencensouly agreed and made into practice in the study area.

Table A.4: Tables shows that the people knows about emergency treatment.

Illnesses	No N=160	Percentage
Not able to breast fed	11	6.88
Sick child	81	50.62
Fever	82	51.25
Fast breathing	21	13.12
Difficulty in breathing	23	14.38
Dysentery	31	19.38
Drinking poorly	17	10.62
Other (Diarrhea, vomiting)	46	28.75

A.4.1: ***Delivery and under-five child feeding practices.***

A total number of 453 (study area: 224 + control area: 229) pregnant women followed up during the interim survey. Around 439 (96.8%) of them have registered for the ANC (study area: 221 + control area: 218) and 447 PNC (study area: 223 + control area: 224) in the study and control area. Around 68 % of the pregnant women in the study area has been registered within 12 weeks of the pregnancy in the study area and control area, while > 90 % have been registered after 12 weeks of pregnancy, while around 85 % had undergone 3 ANC checkups. In the selected sub centres around 80% of the mothers have completed PNC up to 42 days. From the IMNCI records it was observed that the institutional delivery in the study area (Gunupur and Raygada block) has increased significantly after awareness campaign through PLA (Fig A.1). Similarly the status in consumption of Iron-Folic acid, level of anemia and completion of TT immunisation and consumption extra calorie food supplementation up to 82 days provided at AWW has been improved >11 % after creation of community awareness through PLA approach in the study area (Fig A.2). The MMR for the year 2016 was 1.0 in Jemediapentha CHC, 2.0 in Gunupur, 2.0 in Kolnara and 5.0 in Kashipur CHC. However no IMR has been recorded in the sub centres (*Gumma* and *Dangalodi* of Jemediapentha (Raygada) CHC, *Marama* and *Putasing* of Gunupur CHC, *Dumuriguda* and *Bhoimoda* of Kolnara CHC and *Siadimal* and *Sankarda* of Kashipur CHC) during our study in the year 2015 and 2016. With

regard to infant and young child feeding practices a considerable improvement (P<0.05) has been observed. As would appear from Fig A.3, around 98.8 % of the newborns out of 1282 in the study area have started breast feeding immediately after birth, while it was 92 % before intervention, 43% of the infant continued exclusive breast feeding under 1 year, while 88 % under 1 year continued breast feeding along with other supplementation and 49 % of the children continuing breast feeding till five years as per personal interview to the mother. While in the control area no change (P>0.05) has been observed during this period compared to initial phase of survey.

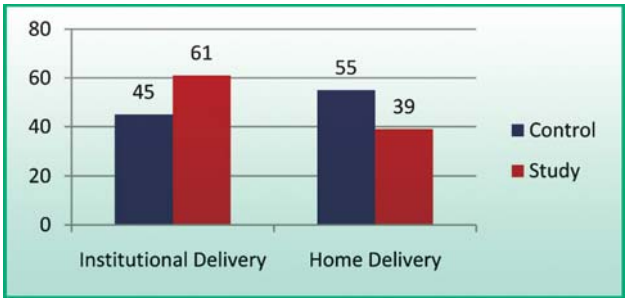


Fig A.1: Institutional vs Home Delivery after 2 years of intervention.

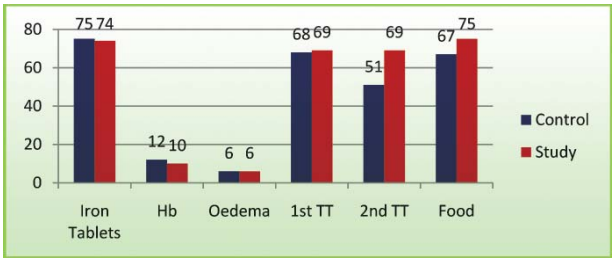


Fig A.2: Record of the ANC of the pregnant women in sampled sub centers of study and control area after intervention.

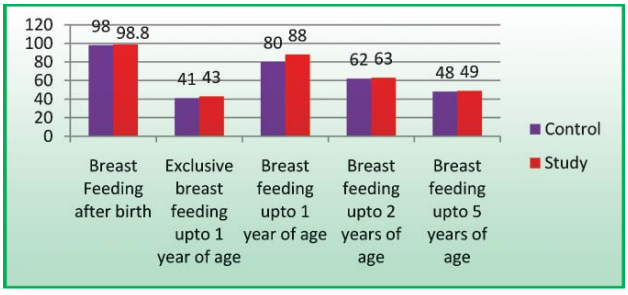


Fig A.3: Breast feeding practices of the children in sampled sub centres after two years of intervention.

A.4.2: ***Immunization coverage.***

Immunization coverage was recorded from IMNCI records and enquiry from the mother and health staff at the sub center level. Coverage is described in **Fig A.4 a & b**. From the data it is evident that the coverage has been significantly increased (P<0.05) in the study area compared to control area after awareness creation. Similarly the coverage of Vit A supplementation has been improved to 61% in study area compared to 58 % in the initial phase **(Fig A.5).**

A.4.3 : Maternal and child mortality in the study area compared to the state average

The National Family Health Survey (NFHS-4) in Odisha revealed remarkable reduction in infant mortality rate (IMR) which declined to 40, which is

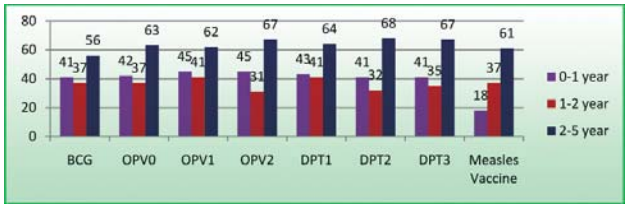


Fig A.4 (a): Vaccination in Control Area

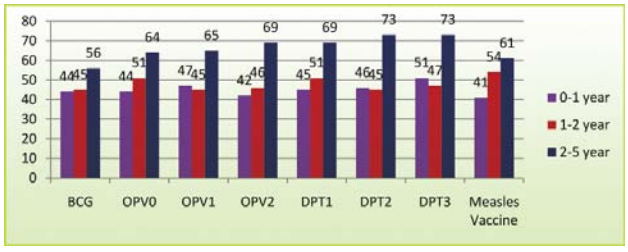


Fig A.4 (b): Vaccination in study Area

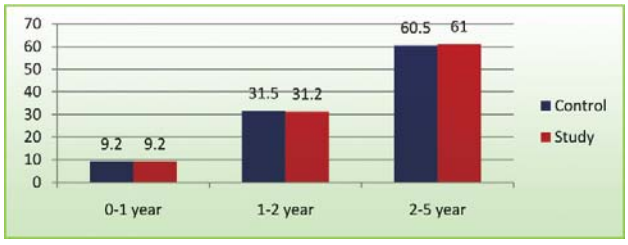


Fig A.5: Percentage of children received Vit-A suplementation.

even better than the all india level of 41. Similary, the underfive mortality rate of the state has also declined from 91.6% in 2005-06 to 49% in 2016. Percentage of institutional delivery in Odisha increased from 35.6% in 2005-06 to 85.4% during 2015-16 due to effective service delivery mechanism and utilization of public health mechanism by the people. Odisha also recorded 78.6% immunization coverage rate by the age of 2 years.

When looked into the district level data: contraceptive prevalence rate of Raygada was 54.9 % of currently married women compared to 57% of Odisha average and percentage who received different types of ANC during prgnancy in Raygada was 59.5 % as against 62% in Odisha state, whereas in our study area the figure has scale up almost to the state figure because of awareness campaign. Similarly, institutional delivery was observed to be around 90 % in the study area in comparison to the Odisha average of 85%. This has ultimately improved maternal and child health parameters.

Besides above, there was significant improvement in nutritional status of the underfives in the study area. Nutritional Assessment of under five children in Odisha (NFHS-4) revealed prevalence of underweight as 34.1% and severe wasting as 6.4%. In comparison, the prevalence of underwieght was recorded to be 20.3% and severe underweight as 5.2% in the studied vilages prior to the intervention which declined to 19.4% and 2.4% respectively in the following intervention period. All the above indicates a positive impact of the intervention as it was targeted. However, the maternal mortality rate (MMR) and infant/child mortality rate (IMR) could not be compared, because data for the specified block or district is not available, as the statistics required a minimum denominator which is not fulfilled in the area but the Odisha average presented above gives an indirect evidence of a significant reduction in the mortality indices, which could be resulted out of combined impact of state programme and project intervention.

A.5: HIMS and Logistic supply

The IMNCI is not adequately reflected in the current HMIS, which is structured to count disease episodes while IMCI uses a syndromic approach to classify illness conditions, thus making it difficult to track IMCI performance through the routine information system. A more complete incorporation of IMCI into the HMIS during our study served to motivate stakeholders to improve performance. Introduction of syndromic conditions in reporting of illness has significantly improved in registration of diseases and appropriate budgeting of IMNCI drugs for the sub centre. We compared the number of routinely registered events in the control area with study area over the same period (as gold standard) for reporting and referral of IMNCI related diseases (respiratory infection, diarrheal diseases, malaria and nutritional status) which revealed a remarkable increase ($P<0.05$) in reporting and referral of cases in the study area. Participation of ASHA/AWW along with ANM/MPHW in the preparation of budget for the drug also increased demand for logistic supply in the intervention area compared to control area.

A.6: Improvement of logistic supply through interaction with the local health system.

The village level health workers were trained to improve upon their reporting of illnesses and stock of drugs and diagnostic kits supplied to them on weekly basis by using a small weekly report form. These activities were made to be supervised by respective ANM who acted as the link with PHC MO I/C. Interactive discussion was made with district health officials and the PHC medical official for monitoring regular supply of drugs and kits depending upon the seasonal variations observed for different diseases in the area.

A.7: Assessment of Morbidity and Nutritional status

A.7.1: ***Morbidity pattern of the under-five children***

An interim morbidity survey was conducted using the designed questionnaire in 112 villages of the

selected sub centers among 3063 (Male: 1460, Female: 1603) children below 5 years for 2 years after initiation of the intervention. The prevalence and pattern of the disease were recorded and analyzed. It was observed that about 208 (6.8%) children had suffered from diarrhea, 1083 (35.4%) from fever and cough, 331 (10.8%) from malaria and 21(0.68%) from measles during the period of survey **(Fig A.7).** Out of 331 children who had malaria, 66.3% children had taken medicine through health system. Amongst 3063 children 33 (1.1%) were malnourished and 28 (0.9%) were suffering from different skin diseases. When compared the morbidity pattern due to different diseases between two different points of time (before intervention vs after intervention) it was observed that there is significant reduction (P<0.001) in the incidence of malaria and fever/cough in study area (Gunupur and Raygada block) compared to control area (Kashipur and Kolnara block). Total number of children covered during the interim survey (Total 3063, Control area: 1781 and Study area: 1282) has been taken as the denominator for calculation of prevalence of the disease morbidity.

A.7.2: ***Nutritional status***

To improve nutrition following measures have been incorporated to strengthen the current ongoing program: nutrition education to community and school children to promote consumption of locally available vegetables and fruits, encouraging kitchen garden practice, education to parents to support ICDS by regular visit to anganwadi centers for anthropometry assessment of their children, reinforcement of preschool level nutrition and coordination with PHC for early management of severe malnutrition.

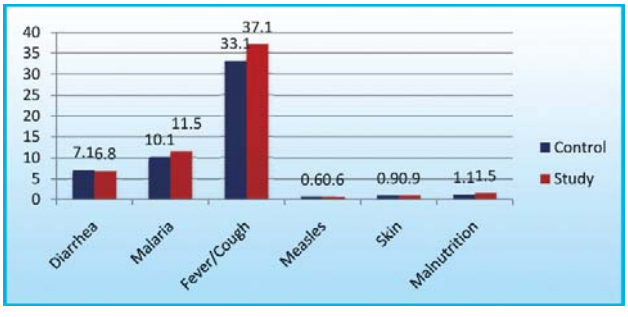


Fig A.7: Morbidity pattern of under 5 children in intervention and control area after 2 years of intervention

The mean weight and height of 870 children (Study area: 430, control area 440) were computed to age and gender and compared with median value of WHO reference values or growth standards. The proportion of underweight children (<-2SD, indicative of acute and chronic malnutrition) was around 40 % of which 10.4% had severely underweight (<-3SD) and about 10% of these children had severely wasting or suffering from severe acute malnutrition (SAM) during the base line data collection without any significant difference between study and control area. However during the interim survey the proportion of underweight children (<-2SD, indicative of acute and chronic malnutrition) was around 31.1 % of which 9.4% had severely underweight (<-3SD) and about 4.2 % of these children had severely wasting or suffering from severe acute malnutrition (SAM) was found to be reduced but the difference between study area and control area did not show any significant difference.

A.8 : Results and recommendations

Baseline survey has shown high under five morbidity with significant gap in training of grass-root level health workers on mother and child health care and referral in the operational areas. Community practice on preventive health especially on use of safe water and hygiene practice was found to be inadequate. To fill up the gaps capacity of village-level health staff have been developed through trainings using simple training module developed in local language and using the ready reckoner while managing the under five illnesses and taking MCH care. The study has shown feasibility of skill development of the health staff especially, the ASHA are mostly below 10th pass at the education level. They could be trained successfully through simplified

training booklets in local language and some practical demonstrations. Community awareness on health/ personal hygiene could also be improved especially through school children as the media of knowledge dissemination. This also improved community participation in health improvement. There was 56.4 % improvement in the level of knowledge and skill after reorientation training, which shows feasible skill improvement at village-level health care delivery. The community interaction and participatory learning approaches shown the way to find out the community needs to improvise the ongoing health programmes that can improve community participation and reach to the outreach sectors. School children have been recruited as a vehicle for transmitting healthy preventive practice like hand washing and other focused health messages were also shown to be feasible in the tribal population, which has worked efficiently to increase the hygiene practice significantly. Improvement in morbidity has been shown as reduction in malaria & diarrheal disorders, improvement in immunization coverage, toilet use, hand hygiene and use of safe drinking water. Enhancement of institutional delivery as well as reduction in severe course of illness indicated positive impact of the intervention. Participation of the district health system in the operational research collaboration has shown a partnership approach of research institution and public health machinery in resolving regional health challenges. It showed that this approach can be replicable by the health system as they were involved from the beginning of conceptualization to implementation.

Recommendations

From the above results the following recommendation can be made to the health system for improving the maternal and under five health status for the outreach areas especially dominated by tribal population.

- Training of lower level cadres (two rounds in a year for ASHA & AWW and one round for ANM) can be instituted in the areas with similar outreach tribal settings with supportive supervision every month.
- The training can be imparted in the line of the training modules developed.
- School health programme can be strengthening by focusing on personal hygiene. The idea of disseminating the health messages through school children to parents/ community can also be replicated.
- More efforts to be invested in community participation in IMNCI (c-IMNCI) using local resources. The IMNCI messages to communities must specify and emphasize the importance of referral care, the rational use of drugs (e.g. that

Table A. 5: Nutritional status of Under-5 Children.

	Study area		Control area		Proportion T –test SA vs CA
Gender	Before intervention	After intervention	Before intervention	After intervention	
N	488	430	580	440	
Underweight ≤ -2D (Weight-for-age)	43.3%	31.%	40.6%	31.8%	P>0.05
Stunting ≤ -2D (Height-for-age)	49.9%	38.7%	46.0%	36.2%	P>0.05
Wasting ≤ -2D (Weight – for-height)	19.5%	11.8%	18.1%	10.0%	P>0.05

not all conditions require antibiotics), and compliance to follow up.

- The local health system can be recommended to undertake quarterly morbidity assessment by looking into the data generated by IDSP, NHM, etc to monitor the logistic need and supply of drugs and diagnostics.
- IMNCI facilitators may be best placed for effectively supervising IMNCI due to their specialist knowledge
- Measures should be taken to ensure effective utilization of the available human resources, through supervision and providing incentives.

3. Estimate the burden of TB among the tribal population and develop an innovative health system model to strengthen TB control in the tribal areas of Odisha

Principal Investigatior: Dr. Tahziba Hussain
Co-Investigator : Dr. Dasarthi Das
Starting Date : March 2015
Closing Date : Feburary 2017
Funding : ICMR (Extramural)

Primary objectives :

1. To estimate the prevalence of TB amongst tribal groups in Odisha.
2. To find out the health seeking behavior patterns of persons having symptoms suggestive of TB.
3. Develop feasible interventions to improve case finding and compliance for TB treatment through a community based approach.

Secondary Objectives :

1. To identify the socio-cultural determinants as risk factors for TB such as socio- demographics (housing, sanitation, occupation), nutritional factors, alcohol, smoking and contact history.
2. To understand the knowledge, attitude and perceptions on TB among Tribals of Odisha.
3. To review the functioning of RNTCP in DMCs, TUs and DTC in tribal areas of Odisha to identify gaps in program implementation (access, implementation).

Findings : Situational analysis, FGDs, Interviews in 6 tribals villages of **Balangir, Dhenkanal, Kandhmal & Mayurbhanj** districts were conducted to study the burden, health seeking behaviour, KAP on TB among tribals & review the functioning of RNTCP in DMCs, TUs and DTC in tribal areas of Odisha.

Phase I : Situational analysis - Field visit and social mapping of the six selected clusters namely Maghamara (Balangir), Jantaribola (Dhenkanal), Penagaberi (Kandhamal) and Bhadua, Gandirabeda and Kasiabeda (Mayurbhanj) districts of Odisha were conducted. District information of all the selected clusters were collected.

Phase II : Qualitative assessment - 12 focus group discussions, 37 interviews of health workers, 4 interviews of influential persons of the selected clusters and 12 interviews of medical officers were conducted.

Phase III : Quantitative assessment - In this phase, **1400 households** were surveyed and **5145 individuals** were screened in Kasiabeda cluster of Mayurbhanj district, out of which **126 chest symptomatic individuals** were identified. The sputum samples were collected and sent to NRL, RMRC, Bhubaneswar. According to the NRL reports, **34 patients** were found to be having active TB disease. **10** were culture positive.

Phase IV : Intervention phase : Awareness camps in tribal villages, orientation training of ASHA, various health workers and follow-up of TB patients was carried out.

Data analysis is going on and the findings will be communicated to an appropriate journal for publication.

4. Title of the project, "A Prospective Study to determine the Incidence of Tuberculosis among Patients with Type 2 Diabetes Mellitus (intra-mural funding).

Principal Investigator: Dr. Tahziba Hussain
Starting Date : March 2014
Closing Date : Feburary 2017
Duration : 3 Years
Funding : Intramural

Objectives :

1. To assess the feasibility of screening patients with diabetes mellitus (DM) for tuberculosis (TB) within the healthcare settings of DM clinic in tertiary hospital in Bhubaneswar.
2. To determine the prevalence of TB among people with Type 2 Diabetes Mellitus.
3. To identify risk factors for TB among people with Type 2 Diabetes Mellitus

Findings : In this study, **1200 patients with Type 2 Diabetes mellitus** were screened for signs & symptoms of TB. Blood samples from these patients were analyzed for various biochemical parameters and HbA1C. Socio-demographic and clinical data were collected from all Diabetes patients using standardized forms. Clinical evaluation of each patient included a detailed history of duration and chronology of chest symptoms like cough, dyspnoea, fever, chest pain, and haemoptysis. Out of **1200 patients**, only **13 (1.08%)** patients had TB active disease. The results show that the incidence of TB among patients with diabetes is less than that reported from other regions. The project has been completed. Data analysis is going on and the findings will be communicated to an appropriate journal for publication.

5. Characterization of post mass drug administration residual microfilaraemics using anti sheath antibodies.

Principal Investigator: Dr. M.S. Bal
Co-Investigator(s) : Dr. B. Dwibedi,
Dr. A. K. Satapathy
Funding : ICMR
Period : Aug 2015 – Sept 2017

Primary objectives

To evaluate the anti-sheath antibody levels in individuals with or without microfilaraemia after DEC treatment in comparison to the control group.

Secondary objective

To find out the association of anti-sheath antibodies with the expression of cellular responses, T-regulatory cells, and cytokine production (Th1 and Th2) in individuals with or without W bancrofti infection after DEC treatment in comparison to the control group

Background:

The antibodies to the sheath of microfilariae have been demonstrated to play a central role in the elimination of circulating MF in human filariasis. But the specific mechanism that plays this role and gives immunity to the individual is not known in filariasis. Though majority of the population have cleared microfilariae (MF) due to mass drug effect, some are yet harboring the infection and known as "residual microfilariae. To understand the behavior of the residual microfilaraemia in a community where the threshold level off microfilaria is achieved through repeated MDA is one of the research priorities of WHO. So there is a need to evaluate the antibodies to microfilarial sheath and relate it to parasitological and CFA levels in the DEC treated microfilaraemic and amicrfilaraemic individuals. This project is formulated to characterize the residual microfilariae using anti-sheath antibody.

Work Done

During this period eight villages have been selected for the study where, 4 rounds of supervised

MDA (DEC+ALB)in addition to regular MDA have been undertaken. We have followed those study subjects whose baseline information as well as history of drug consumption was already available with us. The district has MF below threshold level (less than 1%). Night blood survey has been conducted in 8 villages through a "door-to-door" census between 7-10 PM. Informed consent has been obtained from each individual before collection of blood sample for inclusion in the study. Upon enrolment, individuals underwent a detailed questionnaire that queried their age, clinical history of filariasis and history of drug consumption. *W. bancrofti* infection was detected either by detection of MF in thick blood smear of peripheral blood collected at night between 20:30 and 22:30 by microscopy or by detection of CFA in serum

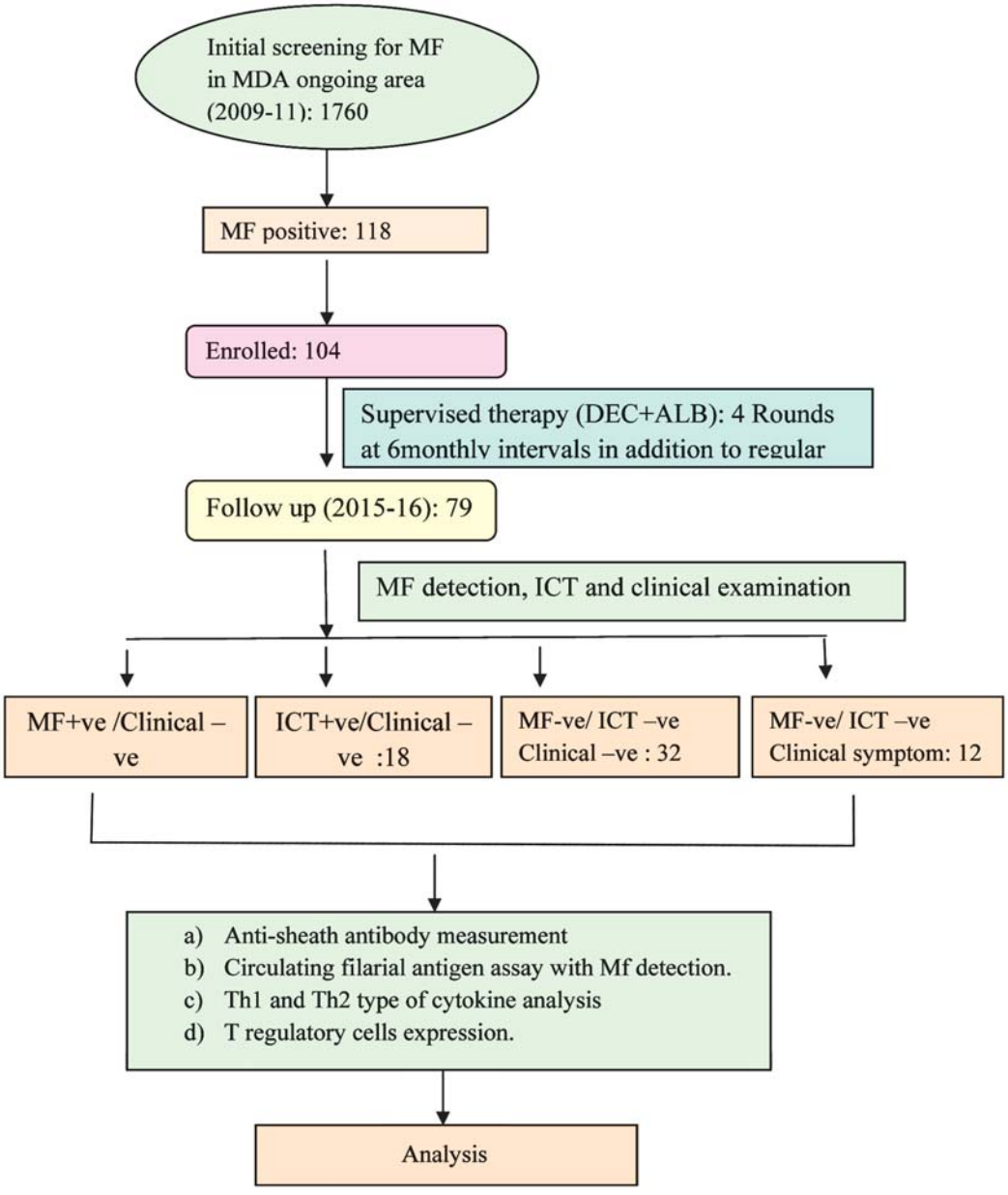


Fig.1. The flow diagram of the cohort study

samples using commercially available Og4c3 assay kit/ ICT kit.

An overview of the enrolment and follow up of participants is presented in Fig.1. During the baseline study a total number of 1760 subjects were screened for the presence of microfilaria. Out of this 118 were found to be positive for microfilariae. Basing on the inclusion criteria 104 were selected for supervise therapy in the previous study. In the present study period we could followed up 79 individuals (age range, 16 – 61 yrs) who were microfilaria positive during the baseline study and had taken 4 rounds of supervised MDA (DEC+ALB) in addition to regular MDA. During follow-up 35 individuals are positive for circulating filarial antigen as assessed by ICT test kit and Og4C3 assay. Of them 17 individuals still harbouring microfilaria (MF+ve) in their circulatio after consumption of DEC distributed during MDA. Out of 79 individuals, 32 individuals have cleared Mf as well as negative for CFA after DEC consumption implies that these are free from infection. Clinical signs/symptoms of filariasiswas carried out by expert clinician in the study individuals. Out of the 79 followed of cases, who were positive initially during implementation of the MDA, 12 have cleared CFA but developed acute symptoms (n=9)and chronic symptom (n=3) of filariasis(Table 1). The rest

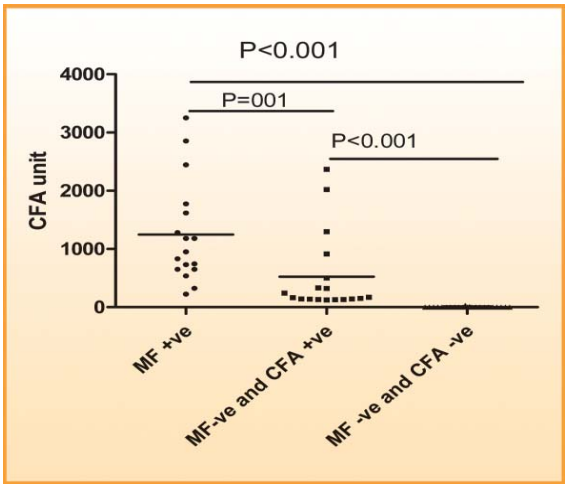


Fig. 2.: Level of circulating filarial antigens (CFA) in different individuals after six rounds of MDA

individuals who were Mf negative at the time of base line survey are still now negative for mf but have consumed DEC during MDA.

Circulating filarial antigen was assessed in all individuals during follow-up. The individuals who were still carrying the infection exhibited high level of circulating filarial antigen as compared to uninfected individuals as shown in fig.2. When the comparison was made between the infected individuals, the groups who were still microfilariae positive have exhibited significantly (P=0.001) high CFA units than the group who were only CFA positive but MF-ve (P=0.001) and those who are negative for both (< 0.001) (fig. 2).

Anti-sheath antibody was assessed in the post MDA microfilaraemic and amicrofilaraemic individuals by immuno-peroxidase assay (IPA) using the microfilariae fixed slide. Out of 17 microfilaraemic individuals only 4 (23.5%) are found to be anti-sheath antibody positive and 11.1% of CFA positive individuals are anti-sheath antibody positive. However out of 32 individuals (MF –ve, CFA –ve) who have cleared both microfilariae and CFA, 78.1% of them have developed anti-sheath antibody and became anti-sheath antibody positive at par with the control group.

Filarial infection leads to an immune environment that is dominated by increased frequencies of regulatory T (T-reg) cells that are considered as suppressor T-cell. To evaluate the impact of MDA on development of T- regulatory cells in microfilaramic individuals, we have analyzed the Tregs inboth MF +ve and MF –veduring this follow up study. Irrespective of the CFA status at the time of follow-up, T-regs cells were significantly high (MF+vevs CFA +ve, p=0.04;MF+ve vs CFA-ve, P=0.005) in individuals who were MF positive at the time of follow up compared to MF negative individuals. Further we have observed high expression of Treg cells in MF-veCFA+ve individuals as compared to MF-veCFA-ve.(P=0.02) as depicted in (Fig 3).

We have quantitatively assessed the level of IL10, the hallmark cytokine for regulatory response (which directly regulate immune response to filarial parasites) in serum of microfilaraemic and amicrofilaraemic individuals to evaluate role differentiating T helper cell subsets in filarial infection. During follow up the level of IL-10 was significantly higher in MF +ve individuals as compared to only CFA positive (P=0.04) and CFA negative (P< 0.0001) individuals. When comparison was made among the amicrofilaraemic group the level was significantly (P=0.006) high in CFA positive group as compared to CFA negative group as shown in Fig 4.

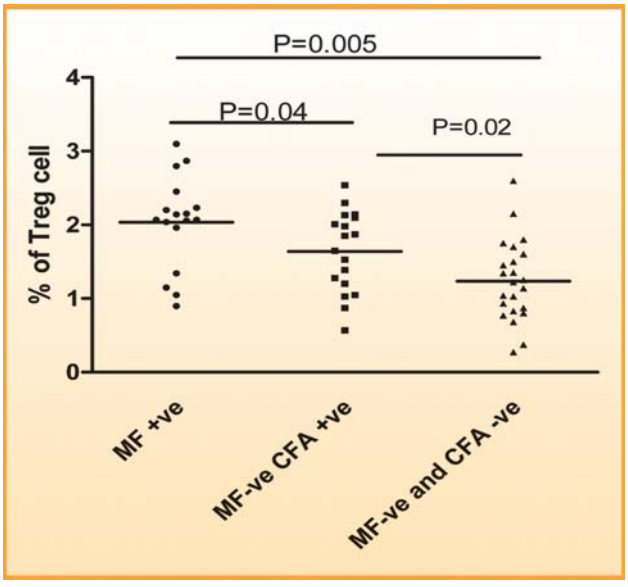


Fig 3: Expression profile of Tregs (CD4+CD25^{hi}) cells in filarial infected individuals after six rounds of MDA children during follow-up.

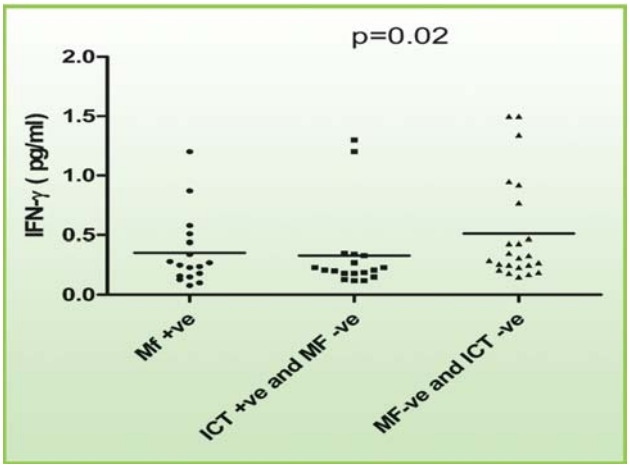


Fig 5: IFN-V levels in the serum of infected and uninfected individuals.

Quantitative analysis of IFN-γ level was done in serum of microfilaraemic and amicrofilaraemic individuals after MDA. IFN-γ level was found to be significantly high in infection free (MF-ve CFA-ve) individuals as compared to infected individual as shown in Fig.5 (P=0.02).

Since IL-10 is known to down regulate the Th1 type of response, we have quantitatively analyzed the IL-10 as well as IFN-v in individuals who have cleared microfilariae and who did not cleared the infection. In order to find out the correlation between these cytokines we have analyzed the levels in the same individuals. A significant negative correlation was observed between the IFN-ϒ and IL-10 in individual who were still microfilaraemic (MF+ve, r= - 0.596, P= 0.01 and circulating filarial antigen positive (r= -0.47, P=0.04) as well as in infection free individuals (r = - 0.780, P < 0.001) as shown in fig. 6.

Conclusions

The study has shown development of anti-sheath antibody in microfilaraemic individuals, who have become infection free after DEC treatmentsuggested that anti-sheath-Ab were involved in elimination of

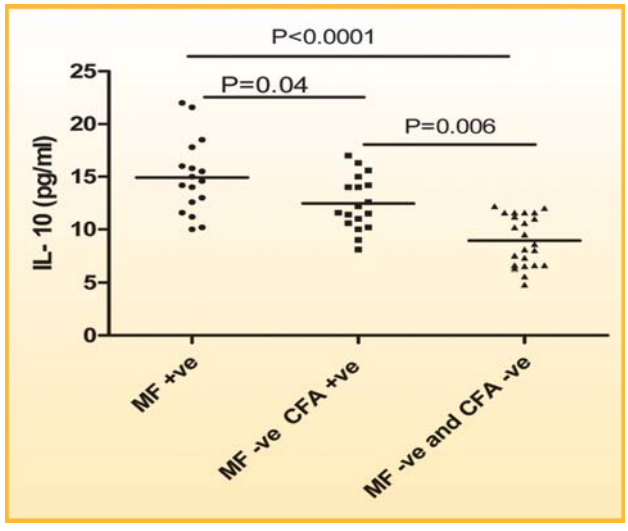
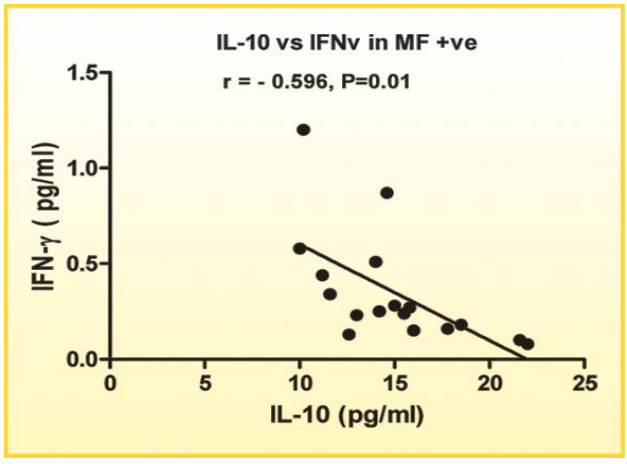


Fig. 4: IL-10 levels in the serum of infected and uninfected individuals.

A



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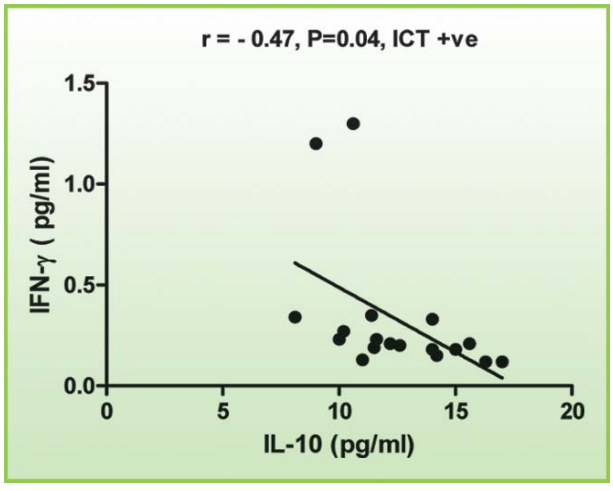

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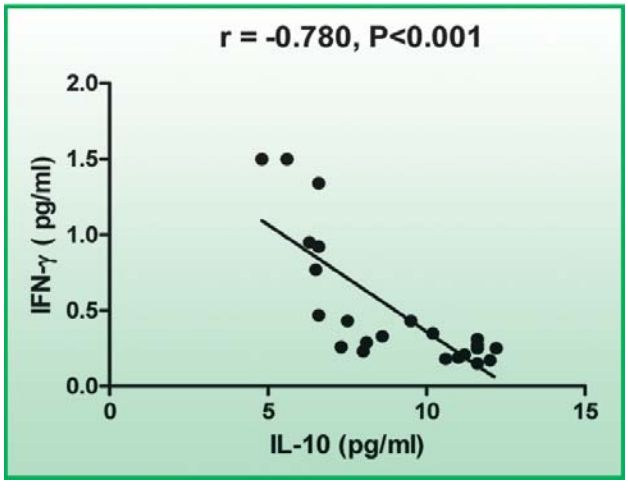


Fig 6: Correlation between level of IFN-γ and IL-10 in individuals who have cleared infection and those who have not cleared the infection.

microfilariae from their hosts, thus appeared to play a central role in a protective mechanism in human bancroftian filariasis. Further high level of Treg cells and IL10 in individuals having residual mifilariaemia reveals that Treg cells/IL10 inhibits development of antisheath antibody and plays a crucial role in survival of Mf, while up-regulation of Th1 type response by elevated IFN-ϒ production and low level expression of Treg cell modulates the immune response of an individual to develop anti-sheath antibody and give protection against filarial infection.

6. Effect of maternal filarial infection on infant's immune response following childhood vaccination.

Principal Investigator : Dr A.K.Satapathy,
Co-Investigator(s) : Dr. M. S. Bal, Dr B. Dwibedi
Duration : Three years
Starting date : Nov 2014
Status : Intramural

Objectives

1. To assess the extent to which maternal filarial infection influences the B-cells response (antibody isotype) to TT and BCG in children
2. To find out whether maternal filarial infection modulate cellular and cytokine production to childhood vaccination in children.

Back ground:

Clinical evidence suggests that chronic antenatal parasitic infection can significantly alter infant immune response to childhood vaccination. Human infected with maternal filarial infection can influence vaccine efficacy by modulating host immune response. Maternal parasitic infection such as Schistosomiasis and malaria during the period of gestation can suppress an infant's later immune responses to standard childhood vaccination.

In general, a Th2 response has been observed in individuals with asymptomatic microfilariaemia or even circulating filarial antigen. These individuals have been shown to display weak antigen specific T-

cell proliferative response, reduced production of IFN-g and elicit a strong type 2 regulatory immune response. It is possible that filarial infection elicit a strong type 2 and regulatory response, which could inhibit type 1 response and diminished the effectiveness of vaccination. It is also presumed that sensitization to filarial antigens in utero may also influence the humoral and cellular responses induced by childhood vaccination.

Therefore we evaluated the extent to which maternal filarial infection influences the immune responses to TT and BCG induced in children born to such mothers.

Methodology:

Study population: The study was performed at the O & G Department of Khurda Hospital in the Khurda district of Orissa, India. Pregnant mothers come for delivery from neighboring villages, which are known to be highly endemic for bancroftian filariasis. The age of the mothers ranged from 18 to 35 years. None of the mothers had symptoms of clinical filariasis at the time of admission. Paired cord and maternal blood samples were collected at the time of uncomplicated delivery. Venous blood samples were collected from mothers before delivery. Venous umbilical cord blood samples from neonates were collected immediately after birth. The collection of cord blood involved direct aspiration via puncture of the ethanol-sterilized umbilical vein at a site distal to the placenta, to reduce minimum cross-contamination. Maternal and cord samples were collected in different sized tubes to avoid the chance of mislabeling. Sera were stored at -70C till further use. The presence of microfilarial status of all pregnant women admitted to the hospital was checked before delivery by examining Giemsa-stained smears

Circulating filarial antigen assay: Detection of CFA was carried out in serum samples using an Og4C3 enzyme linked immunosorbent assay test kit (JCU Tropical Biotechnology, Queensland, Australia) according to the manufacturer's instructions. A serum sample from each individual was tested and the optical density values were used to determine the antigen concentration in units from the standard curve prepared using 7 standard antigens supplied in the kit. Serum samples with an antigen unit of 128 (>titre of standard no. 3) were considered as antigen positive.

Antigen preparation: Tetanus toxin from clostridium tetani (T-3194) procured from Sigma Chemicals was used to measure the antibodies responses in paired maternal and newborn blood samples**.** Heat killed Mycobacteria was obtained from CDFD, Hyderabada. Heat killed mycobacteria were sonicated and used as soluble antigens to measure the antibodies responses.

Determination of antibody isotypes: Antibody isotypes (IgG & IgM) and Ig G subclass to TT and BCG were determined by enzyme linked immunosorbent assay (ELISA). Briefly, polystyrene microtitre plates were coated overnight withTT or BCG (2 mg/ml) in alkaline buffer pH 9.2. Plates were saturated with 0.4% bovine serum albumin in phosphate-buffered saline for 1 h at room temperature. Sera for the detection of IgG and IgM were diluted then added to the plate and kept at 37 C for 3 h. Following incubation with test sera, 1000-fold diluted anti-human IgG peroxidase or 2000-fold diluted anti-human IgM peroxidase or 1000-fold diluted anti-human IgE peroxidase were used for detection of filarial-specific antibodies. The incubation continued for 3 h and, after washing, the presence of antibodies was detected with OPD substrate (Sigma, O-phenylene diamine containing H_2O_2). Adding a drop of 8N sulphuric acid stopped the enzymatic reaction. The absorbance was read at 492 nm using an EIA reader.

Major Observations:

Blood samples from mothers and their cords were collected at the time of uncomplicated delivery from the O &G Department of the District Hospital, Khurda of Orissa, India and examined for CFA status using an Og4C3 ELISA. The samples were classified into three groups based on the presence/absence of

CFA status of the mother and the respective cord blood: Group 1, mother and cord blood were CFA positive (M+C+); Group 2, mother was CFA positive and the respective cord blood was CFA negative (M+C"); and Group 3, mother and cord blood were CFA negative (M"C") Both mother and their new born children are negative for CFA. IgG antibodies to BCG were quantified by enzyme linked immunosorbent assay in all three groups of mother and their respective cord blood samples. There was no significant difference between the Ig G antibodies levels to BCG in filarial infected and uninfected mothers. Decreased levels of IgG antibodies to BCG were detected in cord samples born from infected mothers compared to uninfected mothers indicating down regulation of IgG response in cord blood of infected mothers. Although a high level of Ig G antibodies to TT is observed filarial infected mothers, no significant difference was observed in the Ig G antibodies levels to TT among filarial infected and uninfected mothers. Decreased levels of IgG antibodies to TT were detected in cord samples born from infected mothers compared to uninfected mothers indicating that infection with *W. bancrofti* is associated with an impaired immune response to a vaccine antigen TT, as reflected by relatively impaired antibody responses to TT. IgG subtype distribution is important for our understanding of the specific immune responses to infection and vaccination. IgG1, IgG2, IgG3 and IgG4 antibodies to BCG antigens were assessed in paired maternal and cord blood sera by ELISA. A comparison to the antibody responses of BCG was made in cord blood samples of filarial uninfected and infected mothers. Our results of isotyping and subclass

Fig-1

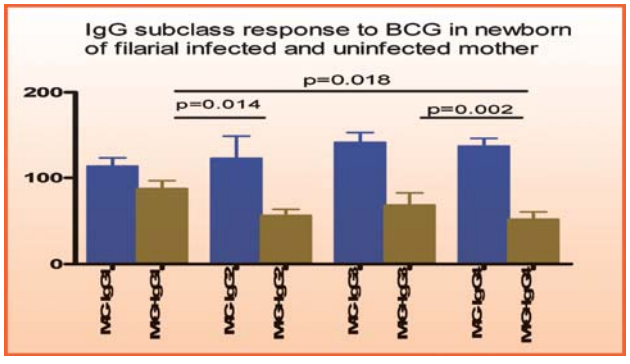


Fig-2

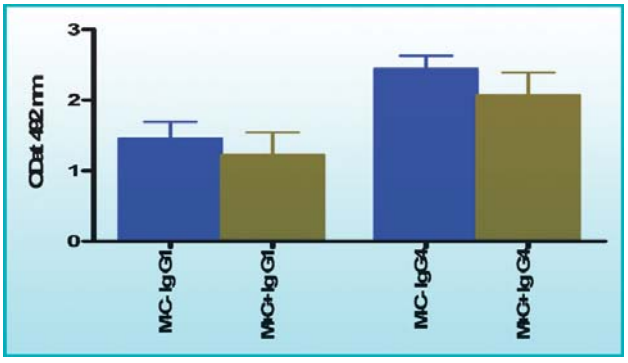


Fig-3

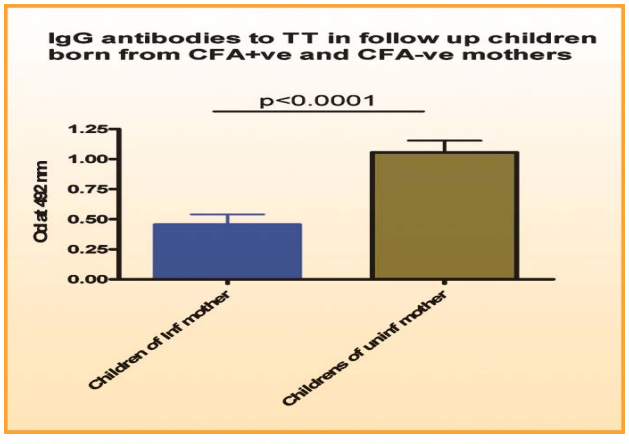
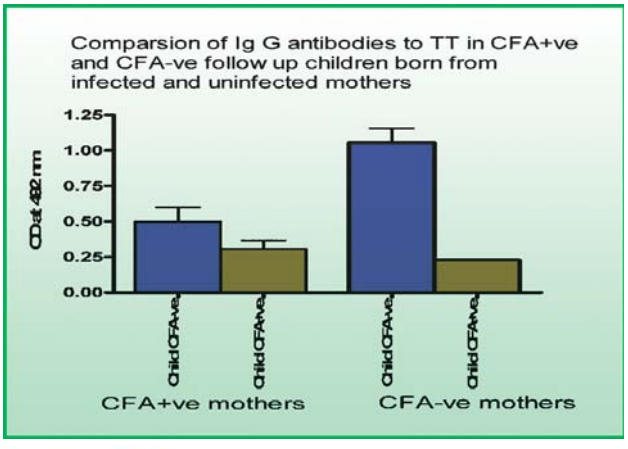


Fig-4



determination of anti-BCG antibodies in cord blood samples from filarial infected and uninfected mother are shown in Fig 1. IgG2, Ig G3 & Ig G4 responses were significantly more in cord blood samples of infected mothers. Among the cord blood of filarial uninfected mothers Ig G3 and G4 were found to be substantially enhanced compared to IgG1 and IgG2. In contrast, among the cord blood of filarial infected mothers IgG1 & Ig G3 response was significantly higher followed by IgG2 and IgG4. Ig G1 and Ig G4 responses to TT in cord blood of filarial infected and uninfected mothers are shown in Fig-2. IgG4 responses to TT were found to be high in cord blood of uninfected mothers like BCG.

The children born from CFA +ve and CFA-ve mother were followed-up. Blood samples were collected from the followed up children. The children were divided based on the presence /absence of CFA of their mothers. To evaluate the impact of maternal filarial infection on development of antibodies to TT in children during their early childhood, we have analyzed the antibodies responses in mothers as well as children born to two groups i.e. CFA positive and CFA negative group during follow up. Ig G antibodies to TT in follow up children born from CFA+ and CFA-ve were quantified (fig-3). Ig G antibodies to TT in children born from uninfected mothers were significantly more in comparison to children born from infected mothers($p<0.001$). Further, based on the presence/absence of CFA in mothers and children during follow-up, the children of CFA positive mothers have been further divided into two group i.e children acquired filarial infection during follow up and children did not acquired filarial infection during follow up. Comparison of IgG antibodies to TT are significantly different between children who acquired infection (CFA+) born from Infected mothers than that of children who did not acquired infection (CFA-) born from Infected mothers.

Conclusion:

We evaluated the extent to which maternal filarial infection influences the immune responses induced to TT and BCG in children born to such mothers. Blood samples from mothers and their cords were collected at the time of uncomplicated delivery, examined for CFA status using an Og4C3 ELISA and the samples were classified into three groups based on the presence/absence of CFA status of the mother and the respective cord blood. IgG antibodies to BCG as well as TT was quantified by enzyme linked immunosorbent assay in all three groups of mother and their respective cord blood samples. Decreased levels of IgG antibodies to BCG as well as TT detected in cord samples born from infected mothers compared to uninfected mothers indicating that maternal filarial infection with *W. bancrofti* is associated with an impaired immune response to vaccine antigen TT and BCG, as reflected by relatively impaired antibody responses to TT and BCG. The study reveal down regulation of IgG response in cord blood of infected mothers.

IgG subtype distribution is important for our understanding of the specific immune responses to infection and vaccination. Our results of IgG subclass determinations of anti-BCG antibodies in cord blood samples from filarial infected and uninfected mother showed IgG2, Ig G3 & Ig G4 responses were significantly more in cord blood samples of infected mothers compared to cord blood of infected mothers. To evaluate the impact of maternal filarial infection on development of antibodies to TT in children during their early childhood, we have analyzed the antibodies responses in mothers as well as children born to two groups. Ig G antibodies to TT in children born from uninfected mothers were significantly more in comparison to children born from infected mothers. Comparison of IgG antibodies to TT are significantly different between children who acquired infection (CFA+) born from Infected mothers than that of children who did not acquired infection (CFA-) born from Infected mothers indicating that children with infection modulates immune responses to TT.

Ph.D Scholars Research Works

Contents

1. To identify the bacteria in the patients of Surgical site infections (SSIs) using molecular assay.

Name : Dr. Himansu Sekhar Behera
Status : National Post-doctoral Fellowship (N-PDF, SERB, DST)
Guide : Dr. M.R. Ranjit (Scientist – F)

Background

A surgical site infection(SSI) is a common Hospital Acquired Infection(HAI), which is clinically defined as "a purulent discharge around the wound or the insertion site of the drain, or spreading cellulitis from the wound" that occurs in any body parts after surgery, which leads to high morbidity and mortality. A recent prevalence study reported that, SSI is the most common healthcare-associated infection, in 31% of all HAIs among hospitalized patients.

Prompt detection of infecting bacteria and appropriate antibiotic therapy, helps in saving lives and prevent debilitating complications. According to a published report, incidence of culture negative pathogens in case of surgical site infections (SSIs), is up to 30%.There are several micro-organisms which cause culture negative SSI such as, atypical slow growing mycobacteria such as: *Mycobacteria fortuitium*; *M.abscessus*; *M. chelonae;* Genital mycoplasmas such as: *Mycoplasma hominis*. A part from these bacteria *Staphylococcus aureus; Nocardia; Actinomyces; Legionella* species sometimes cause culture negative SSI; primarily because of use of bacteriostatic antibiotics.

Almost all hospitals in India identify the causative bacteria by conventional culture method which is the first line laboratory diagnosis methods that can detect only viable organisms, require samples to be immediately processed and are time consuming. To overcome all these problems automated culture methods are being increasingly used in recent years, but pathogen identification rate has not improved substantially. Although bacteria can hide themselves in the conventional culture method and automated culture method due to several factors, their presence can be identified with molecular diagnosis.

Introduction of PCR assay has improved the diagnosis in terms of accuracy, rapidity, specificity and sensitivity. It is too expensive to detect the causative bacteria with respective primers as there are several culture negative bacteria sp. responsible for the SSI. Hence broad range PCR assay with the primers against the variable region of 16S rRNA gene will be much promising and effective in detecting the specific uncultivable bacteria in case of SSI. Sequencing the PCR amplified product followed by homology searching will identify the uncultivable bacteria.

Objectives

To detect and characterize the pathogenic bacteria in the patient samples of culture negative surgical site infections(SSI) using broad range PCR assay with the amplification of a partial region of 16S r RNA gene and sequencing.

Summary of progress

Briefly, DNA isolation from cultured bacterial samples (E.coli) and PCR assay for the amplification of ~762bp and ~1450bp regions of 16S rRNA gene was standardized with the forward primer (5′-CAGACTCCTACGGGAGGCAGCAGT-3′), reverse primer (5′- ACTTAACCCAACATCTCACGACAC-3′) and forward primer (5′-AGAGTTT GATCCTG GCTCAG-3′), reverse primer (5′-GGTTA CCTTGTTA CGACTT-3′) respectively [Srinivasan et al., 2015]. PCR amplifications were carried out in a final reaction volume of 25µl containing 1X reaction buffer (Biolabs), 2.5mM MgCl2, 200µM dNTPs (Biolabs), 0.5 µM forward and reverse primers (IDT), 1.25U Taq Polymerase (Biolabs), milliQ water q.s. and 5µl of extracted bacterial DNA(~0.5ng). PCR assay was

carried out in a thermal cycler (Agilent technology, USA) with the temperature profile: initial denaturation at 94ÚC for 5mins, followed by denaturation at 94ÚC for 1min, primer annealing at 55ÚC for 1min(for ~762bp region) and 57ÚC for 1min(for ~1450bp region), strand elongation at 72ÚC for 1min for 35 cycles, with the final elongation at 72ÚC for 10mins for both the regions. Reaction mixture with 5µl distilled water was used as a negative control and reaction mixture with DNA isolated from culture isolates of Staphylococcus aureus (previously isolated) was used as a positive control in PCR assays. Amplified PCR products were electrophoresed on 1.5% agarose gel and visualized under a gel documentation system (Syngene). Ethical clearance has been taken from the institute. Samples are to be collected from SCB medical college after some paper work, and will be processed for PCR assay following the standardized proptocol. Exact identification of the causative agent will be found with the NCBI-BLAST software.

2. Involvement of Panchayat Raj Institutions (PRIs) in Addressing Rural Health Care Services in Odisha.

Name : Dr. Manoranjan Mohapatra
Status : ICMR-Post-Doctoral Research Fellowship
Guide : Dr. A. Mohapatra, Scientist-E
Date of Joining: February 2017

Background

The Health Sector has improved immensely during last five decade in India. It has reached the most of the corners too. But, it is evident form data there are a large chunk of population are suffering from ill health, disease and premature death, with the given availability of effective and affordable interventions for prevention and treatment, in India particularly in Odisha. Odisha is a state with high Infant Mortality Rate, Under Five Mortality Rate along with high Maternal Mortality Ratio and undernourishment among males in 5 to 18 age groups and females in the 18-59 brackets compare to National Average. With all these sophisticated clinical interventions, technologies and knowledge in hand; still a large gaps exist in health outcomes. It is evidently clear that, the power of health system is not adequate to address these gaps, at present.

The different health, population policies and programmes are highlighted the importance of PRIs in addressing rural health care services. The 73rd and 74th Constitutional Amendments Act, 1992 also guarantee *Panchayats* to take responsibility of the health and family welfare and PRIs members will have the power for resource mobilization. Amid all these available strategies to address rural health care services, the important question arises here whether these elected members and community leaders are really addressing the rural health care services.

Objectives

Overall objective of the study is to examine the role of members of *Panchayat Raj* Institutions (PRIs) in addressing rural health care services in Odisha. The specific objectives are

1. To examine the extent and nature of involvement of members of *Panchayat Raj* Institutions (PRIs) in rural health care services.
2. To study whether the nature and degree of their involvement depends on their socio-economic background and gender.
3. To study co-ordination between PRIs members and health workers to assess the effect on the outcomes.
4. To assess overall impact of involvement of PRIs members on addressing health services.

Summary of Progress

In the first year of the project, pilot survey was

undertaken along with main survey of 8 villages from 4 districts. After pilot survey, the questionnaires were made some necessary correction. Pilot survey was carried out in Malkangiri district of Odisha and the main survey was conducted in the district of Puri, Khurdha, Cuttack and Jagatsinghpur. A total of 8 villages are surveyed as per the sample of the project.

Pilot Survey

This pilot survey was conducted during 13th February to 24th February of 2017. In this survey a total of 50 samples were covered from all stake holders from the field. The stakeholders were surveyed among 6 villages of these two blocks, Malkangiri and Mathili respectively. The villages like Bhaluguda, Pujarimunda and Jhatiguda of the Malkangiri block and Junapadar, Amapada and Matiguda of Mathili Block are surveyed on the pilot basis.

A total of 14 members were surveyed among community members of the above mentioned villages. The community members include both PRIs members and social leaders. PRIs members includes *Sarapanch*, Ward Members, Nominee (*Panchayat* member to Block), Block Chairman, *ZillaParishad* Member, Member of Legislative Assembly and Member of Parliament whereas social leaders are village head, NGO member, Self Help Group (SHG), *PaniPanchayat* Member. Besides, 5 members were included in our survey from Village Health Sanitation Committee (VHSC), which is called *GaonKalyanSamiti* (GKS) in Odisha. A total of 14 health workers such as ASHA, AWW, ANM were surveyed from these villages. Target group which includes both women and men are also surveyed, a total of 8 members, 4 from each category. For in-depth analysis, the pilot survey covered a total of 9 officials of Department of *Panchayat Raj*, Health and Family Welfare and Women and Child Development.

A necessary correction of questionnaires was undertaken after pilot survey.

Field Survey

The field study was conducted from 11th September to 27th October for the district of KhordhaPuri, Cuttack and Jagatsinghpur, situated in the coastal part of Odisha. A total of 56 stakeholders among eight villages named Paikamara, Kantabad, Jenapur, Abadan, Nizigarh, Ranipur, Mahanapur and Ambapada were surveyed, comprising 7 in each village. Village schedule of each village were also filled up.

Source: Primary Survey

A total of 16 members were surveyed among community members of the above mentioned villages. The community members include both PRIs members and social leaders. PRIs members includes *Sarapanch*, Ward Members, Nominee (*Panchayat* member to

Table 1: Different Stakeholderssurveyed among 4 District of Odisha, 2017.

Villages	Community Members	Health Workers	Target Group
Paikamara	3	3	1
Kantabad	3	3	1
Jenapur	3	3	1
Abadan	3	3	1
Nizigarh	3	3	1
Ranipur	3	3	1
Mahanapur	3	3	1
Ambapada	3	3	1

Block), Block Chairman, ZillaParishad Member, Member of Legislative Assembly and Member of Parliament whereas social leaders are village head, NGO member, Self Help Group (SHG), *PaniPanchayat* Member. Besides, 8 members were included in our survey from Village Health Sanitation Committee (VHSC), which is called *GaonKalyanSamiti* (GKS) in Odisha. A total of 24 health workers like ASHA, AWW, ANM were surveyed from these villages. Target group which includes both women and men are also surveyed, a total of 8 members, 4 from each category.

3. Role of gut microbiota in type II diabetes susceptibility.

Name	:	Ardhendu Bhusan Praharaj
Status	:	Ph.D. Scholar
Guide	:	Dr. S.K.Kar.
Co-guide	:	Dr. Namita Mahapatra and Dr. Sapana Negi
Date of Joining	:	December 2013.

Objective

1. To study the biochemical and anthropometric data of type II diabetes patients and controls.
2. Molecular sub-typing and quantification of microbiota from faecal samples from patients and controls.
3. To study associations between clinical and anthropometric data with that of gut microbiota strains obtained.

Background

Humans are co-evolved with the trillions of microbes which inhabit in the bodies and create a complex, habitat-specific adaptive eco system which are finely attenuated to persistently changing host physiology. The gut microbiota are essential for the host immune system, digestion, including the breakdown of complex carbohydrates such as dietary fibres and the production of organic acids to maintain an appropriate pH environment in the gut. Existing reports and clinical studies suggested that obese people with insulin resistance were characterized by an altered composition of gut microbiota, particularly an elevated Firmicutes/Bacteroidetes ratio compared with healthy people. Various environmental factors play a pivotal role in control of body weight and energy metabolism, which is closely, associated to obesity and metabolic disorders such as type II diabetic mellitus (T2DM). The gastrointestinal (GIT) disorders such as inflammatory bowel diseases and colitis, as well as other metabolic disorders such as obesity and diabetes are found to be associated with dysbiosis of gut microbiota. Consequently, it was proposed that altered microbiota in obesity modulates intestinal permeability and increases metabolic endotoxins secretion that lead to chronic low-level inflammation, the pathogenesis of insulin resistance and onset of T2DM. T2DM may be due to multiple risk factors such as genetic liability, age, overweight or obesity, and an unhealthy lifestyle that may be responsible for microbial dysbiosis. The present study was undertaken to develop strategies to control type 2 diabetes by modifying the intestinal microbiota.

Research Work Done So Far (From January 2017 to December 2017)

A total of 401 newly detected type 2 diabetes (T2D) patients within an age group of 30 to 65 years were randomly selected and enrolled in this study from Medicine OPD of IMS & SUM Hospital, Bhubaneswar with the help of physician. A total of 401 healthy control participants from various community, were randomly enrolled as control irrespective of age and sex matched group. Fasting blood samples (0.5ml) were collected (from both patients and controls) in Fluoride vial, 3 ml in serum vial and 1ml in EDTA vials with a written consent. Demographic data including age, sex, occupation,

income, diseases status, family history, dietary patternetc and anthropometric data including height, weight and waist circumference were recorded in pre-designed format. Morning, blood pressure (in sitting position) of patients and controls was also recorded. All the biochemical profiles and insulin resistance status were analysed by using Biochemical Analyzer and ELISA reader respectively. Insulin resistance was calculated by using Quantitative Insulin Sensitivity Check Index (QUICKI). Total bacterial DNA was extracted from 401 patient and 401 control faecal samples by using the QIAamp DNA Stool mini kit (Qiagen GmbH, Germany) according to the manufacturer's protocol. A preliminary real time quantification analysis of stool DNA using 16SrDNA primers was performed. qPCR was performed in Syber Green PCR master mixture (Applied Biosystems, USA) was used to amplify the gene of specific bacterial group.

Results

A total of 401 newly diagnosed T2D individuals (Male=266, Female=135) and 401 healthy controls (Male=251, Female= 150) were included in the study. From anthropometric data, it was found that the mean BMI and weight to be high in diabetic population as compared to that of control. Significantly higher value of FBS, TG, cholesterol, was observed in diabetic individual as compared to healthy controls. HDL was the only parameter found to be higher in control rather than diabetic individual. From insulin analysis of diabetic individuals, the insulin resistance was more in the age group of 41-50 yrs in comparison to other groups.

The present investigation showed a difference in 16s rRNA copy numbers of *Bacteroides* and *Firmicutes* between diabetic and controls groups. *Bifidobacterium* species was found to be lower; while those of *Lactobacillus* and *Faecalibacteriumprausnitzii* were higher in diabetic individuals. In addition, the 16s rRNA copy numbers of *F. prausnitzii* species were found to be higher in control group. The abundance of *Firmicutes* was found to be least, while the proportion of *Bacteroides* was on higher in diabetic persons as compared to healthy individuals. The first and second objective of the work has been consummated and third is in progress.

4. Study on Risk factors for persistence of malaria in Odisha with special reference to molecular analysis of *Anophelines* species complex and malaria transmission".

Name	:	Barsa Baisalini Panda
Guide	:	Dr. Rupenangshu Kumar Hazra, Sci-E
Funding	:	DST Inspire Fellowship
Status	:	JRF (DST)
Date of Joining	:	3rd March 2015

Objectives

- To identify different risk factors for persistence of malaria transmission.
- To identify malaria vectors and its species complex, bionomics, feeding habit and susceptibility status in four geographical regions of Odisha.
- To incriminate the vectors and to find out entomological inoculation rates (EIR).
- To study the incidence of malaria and screening the population by parasite diversity MSP1/ MSP2, GLURP and the drug resistance strain.

Background

Malaria is a global issue and India contributes substantially to global malaria incidence. The geography, ecological diversity and climatic variability make India an ideal place for the widely spread mosquito vectors to breed and transmit malaria parasites. The intensity of parasite transmission is varied with different parts of the country. The north-

eastern, central and eastern states of India are regarded as high malaria transmission zones accounting for nearly 80% of the total malaria incidence and deaths reported in the country. Among these, the worst affected state is Odisha.

Odisha having 3% population of India, contributes 43.6% of total malaria cases of India, 58.2% of *Plasmodium falciparum* cases and about 33% of deaths due to malaria in 2016 (NVBDCP). The bulk of the incidence and perennial transmission is reported at the Southern, Western and Northern belts among the 30 districts, which are mostly covered with forests and hilly areas. These ecological features along with its tropical climatic characterized by high temperature, high humidity and medium to high rainfall provide the most favourable and conducive environment for breeding of vectors and development of malaria parasite, thus making it highly vulnerable to malaria.

Work done so far:

The study was undertaken in 4 geographical regions of Odisha vizNorthern plateau, Central table land, Eastern ghat region and Coastal tract. Mosquitos' sample was collected from 4 districts viz, Kalahandi (Easternregion), Mayurbhanj (Northern plateau), Dhenkanal (central table land) and Khordha (Coastal belt).

A simple and low cost method was developed for extraction of DNA from DBS (Dry Blood Spot) using Chelax-100.

Results

Out of 1687, mosquitoes (14 species) collected 3 vectors i.e *An. culicifacies, An. fluviatilis* and *An. annularis* were found to be the dominant species (46.2%, 3%, and 9.8% of total collection respectively) in the study area. The mosquito collected from human dwelling, *An. annularis* was the predominant (35.6%) species followed by *An. fluviatilis* (10.5%).In cattle sheds, *An. culicifacies* was the predominant species constituting 23.7%. Total man hour density calculation revealed that *An. fluviatilis* and *An. annularis* were most prevalent during the winter season and *An. culicifacies* was most prevalent in rainy season. Blood meal analysis showed that the *An. fluviatilis* and *An. annularis* preferred human blood than that of other animals. Three vector species, *An. culicifacies* (n=150), *An. fluviatilis* (n=150), *An. annularis* (n=150) were subjected to multiplex PCR for identification of sporozoites (*P. falciparum)* and blood meal intake (H. sapiens). 77 specimen, 93 specimen and 84 specimen of *An. culicifacies, An. fluviatilis* and *An. annularis* were found positive for human blood with a sporozoite rate 2.2%, 1.1% and 0.6% respectively (fig-2).

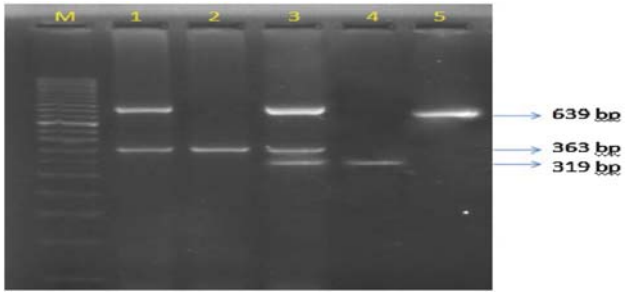


Fig:1: Ethidium bromide stained gel-electrophoresis of Multiplex PCR products for detection of host specific blood meal. Lane 1,3,5: *Homo sapiens* (Human) (639bp), lane 1,2,3: *Capra hircus* (Goat) (363 bp), Lane 3,4: *Bosprimigineius* (Cow) (319 bp). Lane M: 50 bp DNA ladder.

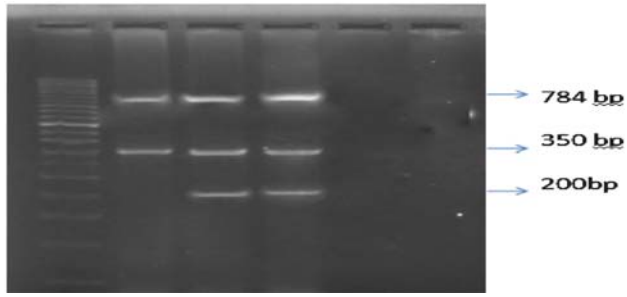


Fig-2: Ethidium bromide stained gel-electrophoresis of Multiplex PCR products for detection of *Plasmodium* parasite. Lane 2, 3, 4: Universal (784bp), lane 2,3,4: *P. falciparum* (350 bp), Lane 3,4: *P. vivax* (319 bp). Lane 1: 50 bp DNA ladder.

The insecticide susceptibility test conducted for *An. culicifacies* during May 2017 in Urladani village of Kalahandi district concluded with the former being resistant to 4% DDT and completely susceptible to Cyfluthrin. A total of 100 blood samples collected from Kalahandi and Khurda district stored on 3MM Whatman filter paper and theresults obtained on DBS by the PCR assays were compared tothe results of microscope, which shows 100% similar result. Of 100 blood samples, 33 were positive for *Plasmodium falciparum* and 15 were positive for *Plasmodium vivax*.

Discussion:

An. fluviatilis and *An. annularis* were predominantly found more in and around human habitation than cattle sheds but *An. culicifacies* were mostly found in cattle shed. The number of adult *An. culicifacies* usually increase a few weeks after the beginning of the rainy season, as the rainfall creates temporary breeding sites (puddles) that are very productive. During the starting of Autumn season includes in the present study, the population of *An. culicifacies* decreased and *An. fluviatilis* became predominant as the climatic condition favoured the development of breeding sites suitable for the latter species.

Blood meal analysis showed that the *An. fluviatilis* and *An. Annularis* preferred human blood than that of other animals.

Parasite density rises soon after the start of the early monsoon in July reaching first peak in August, because the rain water provide good breeding sites for mosquito vectors. As vector population increases, transmission of infection subsequently rises hence there is an increase in parasite densities.

Dried blood spots (DBS) on filter paper facilitate the collection, transport and storage of blood samples for laboratory use. In the developed Chelax protocol, DNA was extracted a few hours prior to the PCR amplification, which may be important for optimal results.

5. Role of Wolbachia in Aedes mosquitoes and its effect in transmission of Dengue and Chikungunya.

Name : Ipsita Mohanty
Guide : Dr. Rupenangshu Kumar Hazra, Sci-E
Funding : Lady Tata Memorial Trust
Status : JRS-LTMT
Date of Joining : 21st August 2014

Objectives:

- Prevalence of *Wolbachia* and its characterization in four different species of *Aedes* found in Odisha.
- Establishment of *Wolbachia* colonies in *Aedes* mosquitoes and study of its dynamics both in laboratory and field conditions.
- To evaluate the factors responsible for cytoplasmic incompatibility.

Introduction:

Ae. aegypti and *Ae. albopictus* are known vectors for numerous viral infections like Dengue, Chikungunya and Zika, etc. *Wolbachia*, a gram negative endosymbiont, harboured in many insect species is responsible for reproductive alterations (Cytoplasmic Incompatibility, Male killing, Parthenogenesis and Feminization) in the host. The present study is undertaken to compare between simplex and multiplex PCR along with the comparison between PCR technique and microscopy for *Wolbachia* detection. Strain typing for only single infection is also carried out using Multiple Locus Sequence Typing (MLST) primers.

Results:

1. **Mosquito collection and *Wolbachia* detection:** The collection was carried out in 5 districts of

Odisha as compared to 13 districts surveyed in last years'. A total of 897 immatures and 98 adult *Aedes* mosquitoes were collected. *Wolbachia* was screened from the mosquitoes using microscopic and molecular techniques.

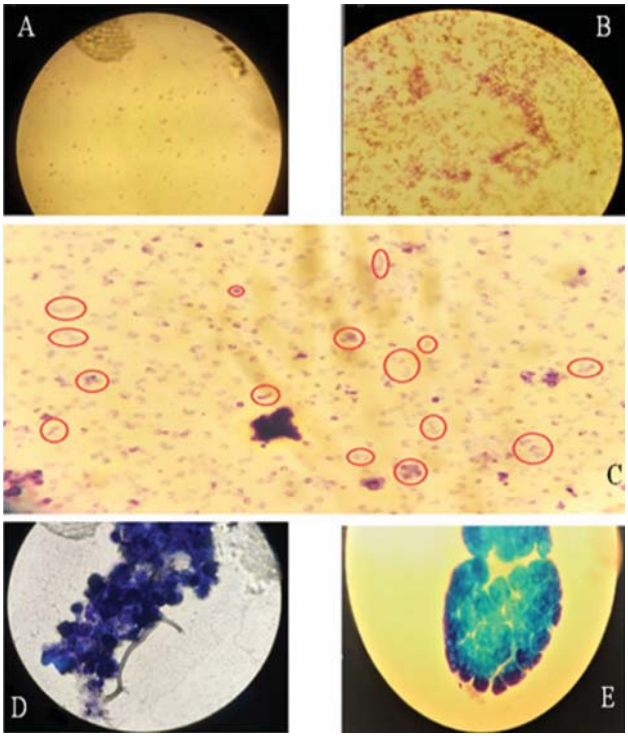
2. **Microscopic detection using Geimsa stain:** Fig 1: (A) Giemsa stained smear of teased ovary of Ae. aegypti without Wolbachia. (B) Giemsa stained smear of teased ovary of Ae. albopictus with Wolbachia colonies. (C) Giemsa stained smears showing pleomorphic forms (red rounds) of Wolbachia in Ae. albopictus. (D) Giemsa stained ovary of Ae. aegypti without Wolbachia. (E) Purple stained Wolbachia on the follicle cells of ovary in Ae. albopictus.

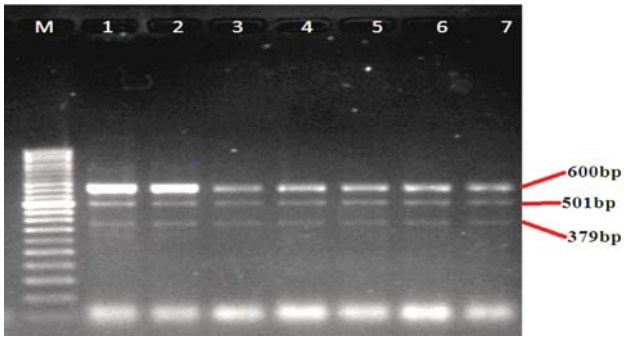
3. **Multiplex PCR for detection of *Wolbachia* and its strains:** Fig 2: *Ae. albopictus* collected from different areas of Odisha showing *Wolbachia* specific *wsp* general primers, *wsp* A subgroups (*alb*A) strains and *wsp* B subgroups (*alb*B) strains of *Wolbachia* specific primer that amplifies around 600bp, 379 bp and 501bp respectively. (M-50 bp DNA ladder)

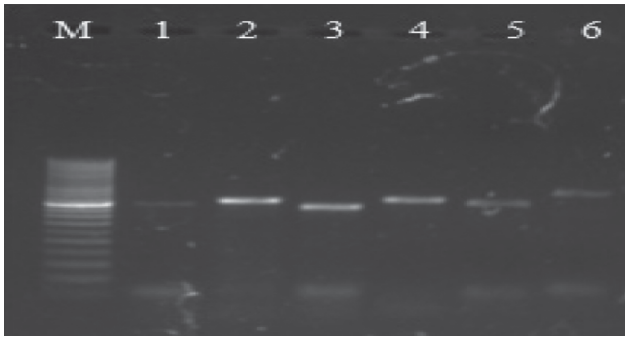
4. **Strain typing by MLST: Fig 3:** *Ae. albopictus* collected from Odisha showing *Wolbachia* strain typing by MLST for monoinfection ie *gatB* 471 bp, *coxA* 487 bp, *hcpA* 515bp, *ftsZ* 524bp and *fbpA* 509bp, *wsp* 601 bp (M-50 bp DNA ladder).

Discussion:

In this study, more areas are covered to know the prevalence and characterization of *Wolbachia* in different *Aedes* species found in Odisha. Microscopic analysis of the bacterium using Giemsa stain revealed that these cells are pleomorphic (rods, cocci, spiral, bacillus and chain forms). Multiplex PCR helped in detecting *Wolbachia* together with both of its strains, thereby confirming its mono or super infection. The







newly synthesized primers further assured the reliability of the previous designed primers (Zhou et al, 1998). MLST primers (Baldo et al., 2006) further helped in assuring conserved genes of the *Wolbachia* genome. Nucleotide sequence determination of internal fragments from multiple housekeeping genes is the basis of MLST approach which helps in direct assignment of alleles. The method is unambiguous and distinguishes more alleles per locus, thus allowing high levels of discrimination between isolates by using half of the loci. MLST using five loci therefore reliably identified the major *Wolbachia* lineages. In this study we compared microscopic examination by a conventional Giemsa staining procedure with a PCR. PCR is more sensitive as it can not only detect *Wolbachia* but is also able to differentiate between the strains of *Wolbachia*. The Giemsa staining technique can be used to screen the members of the endobacteria *Wolbachia* easily, even in a simple laboratory without any special facilities or even in the field condition and for handling large number of samples in a shorter duration. Multiplex PCR is more advantageous than simplex PCR as in one step both the strains along with *Wolbachia* infection are detectable. Dengue infected blood sample confirmed the presence of DENV-2 serotype.

6. Prevalence and genetic diversity of *Staphylococcus aureus* associated with hospitalized septic patients from Odisha.

Name : Anima Mohanty
Guide : Dr. B. B.Pal
Status : Ph.D. Scholar
Date of Joining : ars (2015- 2017)

Objectives

1. Phenotypic characterization of Staphylococcus aureus with special reference to Methicillin Resistant strains isolated from septic patients from Khurda, Bhubaneswar and Cuttack areas.
2. Detection of various toxic genes and clonality among isolated Staphylococcus aureus stains.

Progress of work:

The incidence of different bacterial pathogens and their antibiogram profile isolated from septic patients from Khurda, Bhubaneswar and Cuttack areas was studied from March 2015 to December 2017. Out of 2200 patients 2109(95.8%) were culture positive for different bacterial pathogens and 91(4.1%) were culture negative. Bacteriological analysis of the culture positive cases revealed 452(20.5%) were *Staphylococcus*

Table 1: Prevalence of *Staphylococcus aureus* from different septic patients.

Clinical cases	Total cases	Culture +ve	*S.aureus*	MRSA
Accidental	223(10.1%)	215(10.1%)	22 (4.8%)	20(4.7%)
Burn	101(4.5%)	98(4.6%)	7(1.5%)	7(1.6%)
Soft tissue Infection	510(23.2%)	501(23.7%)	195(43.1%)	190(44.4%)
Abscess	252(11.5%)	216(10.3%)	33(7.3%)	30(7%)
Ulcer	940(42.7%)	905(42.9%)	137 (30.3%)	130(30.4%)
Surgery	132(6%)	128(6.1%)	56 (12.4%)	51(11.9%)
Gangrene	42(1.9%)	42(1.9%)	2(0.4%)	2(0.4%)
Total	2200	2109(95.8%)	452 (20.5%)	428(83.7%)

aureus, methicillin resistant *S. aureus* (MRSA) species-428 (20.3%). Most of the patients were from the community attending the OPD of the hospitals and few were hospitalized indoor/ ICU patients admitted for burn cases, accidental case, etc. About 91 patients were having secondary infection; among which 7 were burn cases, 3 was hemiplegia (bed sore) case and rest were post-surgical and ulcer cases.

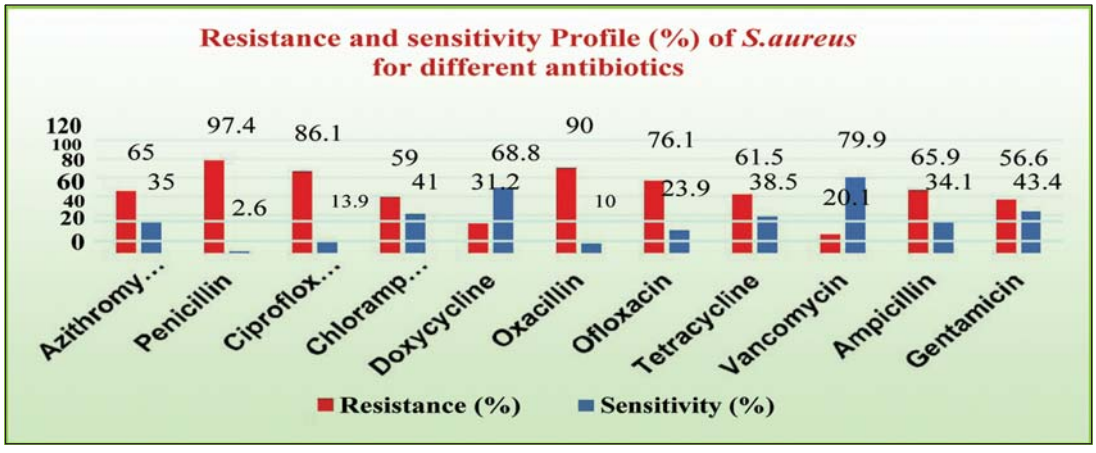
Table 2: Age and sex distribution of S. aureus positive cases.

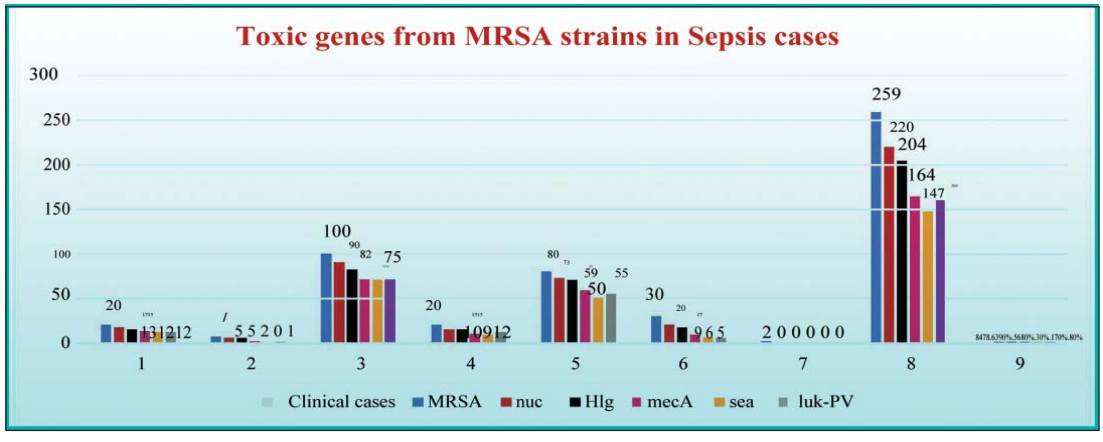
Age	Gender	
	Male	Female
>18 - <30	7 (1.5%)	10(2.2%)
>30- <40	104(23%)	87(19.3%)
>40 - <50	54(11.9%)	27(13.7%)
>50 - <60	90(20%)	73(16.2%)
Total	255 (56%)	197 (44%)

Maximum *Staphylococcus aureus* infected cases were seen in the age group of 30-40 years in both male-104 (23%) and female- 87(19.3%) followed by age group 50-60 years then 40-50 years. Least cases were found in age group 18 -30 years.

The isolated *S. aureus* was found to be resistant to antibiotics such as azithromycin, doxycycline, ciprofloxacin, tetracycline, gentamycin, ofloxacin, chloramphenicol, ampicillin and oxacillin. Among the various antibiotics, the isolated *S. aureus* strains revealed resistant to methicillin (MRSA) and vancomycin (VRSA) strains, 83.7% and 20.1% respectively.

The *S. aureus* were isolated by standard microbiological technique and further polymerase chain reaction (PCR) amplification was performed for different toxic genes.





1. *Nuc* gene is an extracellular thermostable nuclease gene. This gene helps in identification of *S. aureus*. Out of 259 positive samples 220 (84.9%) were positive for *nuc* gene.
2. *Hlg* gene is hemolysin gene. Out of 259 positive samples 204 (78.8%) were positive for *hlg* gene.
3. *Mec* A gene is Methicillin resistant gene. Out of 259 positive samples 164 were positive for *mec* A gene.
4. *Sea gene is* enterotoxin gene. Out of 259 positive samples 147 were positive for *sea* A gene.
5. *Luk-PV* gene is panton-valentine leukocidin gene for community acquired infection.

Out of 259 positive samples 160 were positive for *luk-PV* gene.

Thus it interprets the amplification of different toxic genes in different clinical cases.

Further clonality of *Staphylococcus aureus w*ith special references to Methicillin Resistant strains (MRSA) will be done in the upcoming months.

7. Molecular Epidemiology Of Scrub Typhus In East Coast India.

Name : Mr. Subhojeet Biswas
Status : JRF(Dbt)
Guide : Dr. M.R. Ranjit
Co-Guide : Dr. Madhusmita Bal
Date of Joining : August 2017

Objectives:

1. To find out the most prevalent strain of *O. tsutsugamushi* causing scrub typhus in East Coast India.
2. To find out the genotype-phenotype relationship of *O.tsutsugamushi* among different clinical group of patients of in East Coast India.

Methodology

Study design: A prospective study study will be carried out on Scrub typhus patients among Odisha.

Sampling:

Over 200 scrub typhus positive patients from different peripheral Primary Health Centres (PHCs) and hospitals in the state of Odisha will be recruited in the study. 2ml Blood sample of patients will be collected for type of Hemoglobin analysis and molecular study.

Ethical approval will be obtained from the Human Ethical Committee, Regional Medical Research Centre (ICMR), Bhubaneswar, Odisha, India. Informed consent will be taken from subject/parents /guardian of the subject before recruiting them in the study.

A questionnaire will be prepared to collect the demographic data like age ,sex, height, weight, the socio-economic background, the residing area and sign and symptoms of disease including, age of onset of symptoms, history of blood transfusion , age when first transfused taken, history of hospitalization .

Study population:

Inclusion criteria:

1. All the cases of pyrexia of unknown origin (PUO) needs to get included in our study since scrub typhus is generally associated with fever, headache, myalgia, ARDs (acute respiratory distress syndrome) and likewise similar conditions.

2. Patients with acute kidney injury (AKI) also needed to be included in our study because scrub typhus if untreated or if diagnosed late can might lead to AKI along with multiple organ dysfunction like of liver, spleen etc.

Exclusion criteria:

1. Patients having fever whose cause is known like simple influenza were excluded from our study.
2. Patients whose cause of kidney injury was diagnosed to be due to blood pressure, diabetes, hypertension, drug abuse were also excluded from our course of study.

Laboratory tests to be done:

1. All the blood samples with acute kidney injury(AKI) or those with suspected scrub typhus disease are collected from different hospitals and nursing homes of different regions of Odisha like cuttack, keonjhar, Bhubaneswar, paradip and likewise so.
2. Immunochromatographic test (Ict) was performed primarily against scrub typhus specific antigen and if found positive was then further subjected to ELISA technique for detecting Immunoglobulin M (IgM) antibodies . The ELISA technique is thought to be more reliable and confirmatory technique for diagnosing the scrub typhus antigen.
3. DNA extraction is needed to be done from blood or eschar samples of scrub typhus patients which is then subjected to PCR analysis (the most authentic and accurate technique for identifying the scrub typhus antigen).
4. Finally the PCR products were subjected to agarose gel electrophoresis for detection of the pathogen.
5. In due course of time RT-PCR(Real Time PCR) can also be performed for justification of our result.

Work progress:

A total of 125 acute kidney injury (AKI) samples were collected from S.C.B. Medical College, Cuttack; out of which 54 samples were ICT positive for scrub typhus. Further, for confirmation, DNA was extracted from blood and eschar samples of those kidney injury patients and subjected to PCR assay. Finally, amplicons were run on 1.5% agarose gel for detection of the pathogen causing scrub typhus. In addition to it Scrub Typhus detecting IgM ELISA was also performed using IN BIOS international kit for authentication of our result.

Publications and Information

Publications

Publications 2017

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5. Dehury, B., Behera, S. K., & Mahapatra, N. (2017). Structural dynamics of Casein Kinase I (CKI) from malarial parasite Plasmodium falciparum (Isolate 3D7): Insights from theoretical modelling and molecular simulations. *Journal of Molecular Graphics and Modelling*, *71*, 154–166. https://doi.org/10.1016/j.jmgm.2016.11.012
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Publication in Book Chapter:

1. Debdutta Bhattacharya & Mahapatra N. Herbal Drugs in Advances in Ethnobotany. Published by Satish Serial Publishing House, **New Delhi, 2018.** Page 341-49.

Awards

1. Dr. Sanghamitra Pati, Director of the centre received AARYA AWARD at 5th edition of Aarya Awards on 6th March marking the International Women's Day from Nobel Peace Prize winner and child rights activist Kailash Satyarthi.
2. Dr. B.B Pal, Scientist-F ,received the F.Z.S.I. Award from the Zoological society of India during "29th All India Congress of Zoology" held on June 2017 at ICAR-CIFRI, Barrackpore, Kolkatta-120, India as a Fellow of the Society.
3. Dr. M.S.Bal, Scientist-C, received best oral presentation award by NAVBD during 13th Conference on Vector and Vector borne Diseases organized by NAVBD and CUTN, Thiruvarur at Chennai from 27th Feb to 1st March 201.
4. Dr. BrindaChander, ICMR-PDF under Dr. Debdutta Bhattacharya, won the 1st prize in oral Presentation for her abstract entitled "Alternatives in tackling enzyme mediated resistance" at International Conference on Anti-Microbial Resistance (AMR) held at ICMR-National Institute of cholera & Enteric Diseases during 16-17th Febuary, 2018, jointly organized by NIPER, Kolkata & NICED.

Central Facilities:

E- Library (Knowledge Resource Centre)

ICMR-RMRC, Bhubaneswar Library & Information Centre is known as Laxmi Narayan Memorial Library also known as Knowledge Resource Centre (KRC) of the Institute. It plays a vital role in the collection development and dissemination of scientific and technical information to meet the present and future needs of the center, and also provides facilities and support to the scientists, researchers, students, staff and its networked centres. The library has a good collection of Journals, books and other relevant research material on Clinical Medicine, Immunology, Microbiology, Molecular Biology, Epidemiology, Entomology, Public Health, Biostatistics, Bioinformatics, Nutrition, and Genetics& Medical Anthropology and enriched in e- resources through subscription and consortia.

E-Resources:

The Institute Library subscribes e- resources for the scientists and researchers either through consortia or through subscription. Presently, library subscribes following databases.

- **EBSCO database**: It carries more than 3000 fulltext journals (MEDLINE complete) along with E- Book collections.
- **ERMED Consortia**:Electronic Resources in Medicine (ERMED) Consortium is an initiative taken by Director General of Heath Services (DGHS) to develop nationwide electronic information resources in the field of medicine for delivering effective health care for all. The Consortium is being coordinated through its headquarter set up at the National Medical Library (NML).The ERMED resources can be searched and browsed through a versatile search platform i.e www.nmlermed.in . Presently 241 journals are subscribed through ERMED consortia from five publishers like (1)BMJ publishing group (2) Cambridge university press (3) Oxford university press (4) Wiley online library (5)Wolters and Kluwer
- **ICMR E- Consortia**: Library subscribes world's top weekly research journals in the field of Science, Technology & Medicine. Nature (http://www.nature.com), Science (http://www.sciencemag.org) (3) New England Journal of Medicine (http://www.content.nejm.org) (4) Lancet (http://www.thelancet.com).
- **Library Services:n**RMRC Library provides two types of CAS i.e DAS & Monday Morning to satisfy the scientific curiosity of scientist.
- **Daily Article Service (DAS)** : DAS is an current awareness service which serves the purpose of sending scientific research paper daily through e-mail based on the demands and needs of the ICMR scientist and doctors. During the session 2017-2018; total 243 research paper have been

sent out of which 65 research papers focused on communicable diseases based on topic such as HIV AIDS, Leishmaniasis, Scrub Typhus, Tuberculosis, Typhoid, Vibrio Cholerae etc. While majority of the research papers were on non- communicable diseases like Malaria, Rheumatoid Arthrities, Type 1 Diabetes, Alzheimer's Disease etc.

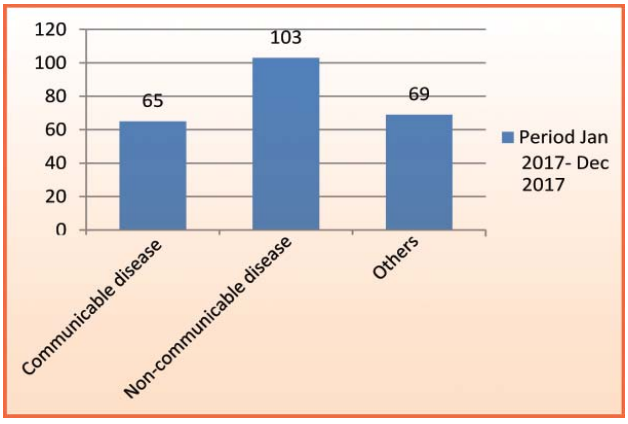
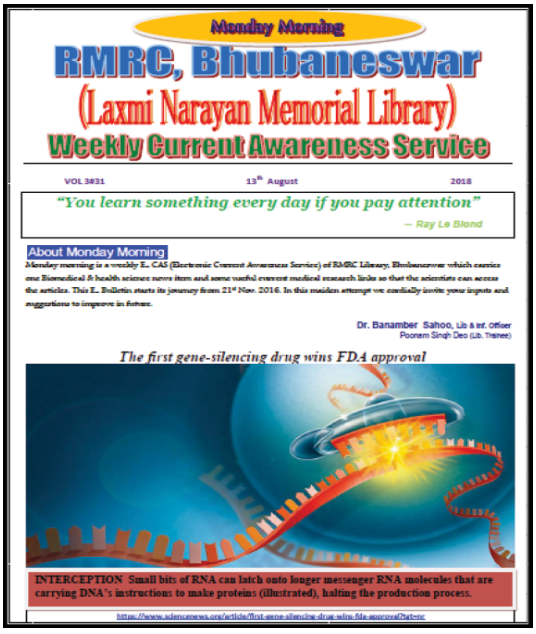
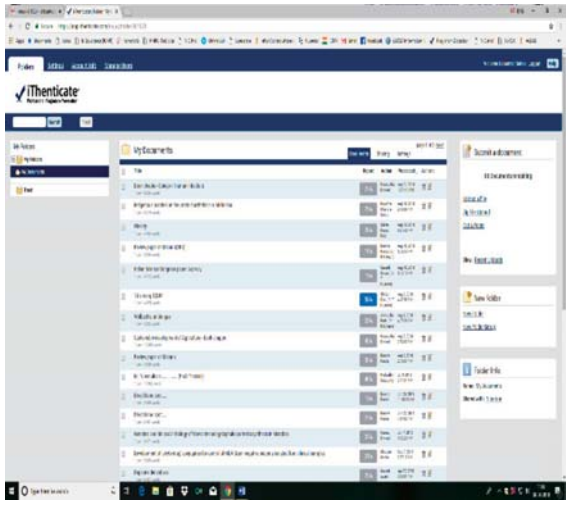


Fig.1: Depicting Distribution of Research papers in DAS service.

Monday Morning:

Monday Morning is an initiative of RMRC library which started its journey from 21st Nov. 2016.


Monday Morning
RMRC, Bhubaneswar
(Laxmi Narayan Memorial Library)
Weekly Current Awareness Service
VOL 3#31 13th August 2018
"You learn something every day if you pay attention"
-- Ray Le Blond
About Monday Morning
Dr. Banamber Sahoo, Lib & Inf. Officer
Poonam Singh Deo (Lib. Trainee)
The first gene-silencing drug wins FDA approval
INTERCEPTION Small bits of RNA can latch onto longer messenger RNA molecules that are carrying DNA's instructions to make proteins (illustrated), halting the production process.



Monday Morning is a weekly E- Bulletin of RMRC Library containing current Biomedical &Health science news. It intends to disseminate the information regarding recent development in the field of biomedical research in a condensed way.

Plagiarism check:

Plagiarism is considered as an academic dishonesty and a breach of journalistic ethics. It is subject to sanctions such as penalties, suspension, and even expulsion from service. Plagiarism is not in itself a crime, but can constitute copyright infringement. In academics and research it is a serious ethical offense. To avoid plagiarism in research, ***iThenticate***plagiarism software is being used. Before sending manuscript for publication and thesis forPh.D submission it has become mandatory for plagiarism check which is being done in the library.

Library Trainees: The library & information division of the Centre have recruited two Library Trainees for the tenure of one year. The trainees are recruited as per Govt. of India apprentice scheme. During their training they undergoes various library activities such as collection development, acquisition of books, binding of journals , e- journals subscription, News clipping activities etc. They have attended the National conference conducted by Odisha Library Academy and TCS on Big data. They had hand on

News Clippings in Library

experience on library automation software Koha & institutional repository software D-SPACE.

Animal House facility:

The RMRC animal facility is maintain and monitor as per the guide line of CPCSEA, Govt. of India, Min. of Eniv, Forests & Climate Change, (Animal Welfare Division) New Delhi to carry research on experimental animals. With the present facilities of inbreed Mice (Balb/C) and Rabbit (New Zealand white), we have added a new species of mice namely C57/B6 (Black 6) for our research purposes. All the experiments on animal are rooted though the Institutional Animal Ethical Committee, which is also formed according to the norm of CPCSEA, New Delhi. Two new projects entitles ""**In vivo studies on antidiabetic effect of Trikatuchurna loaded casein microparticles"** and "**Molecular mechanisms of phytocompounds against NDM-1 and ESBL producing gram negative bacteria"** on use of laboratory animals has been presented in the last IAEC. Presently animals are being used in maintenance of mosquito colony etc.

OPD Activities of the Centre:

Regional Medical Research Centre, Bhubaneswar, one of the sister institutes of Indian Council of Medical Research (ICMR) has established a new facility for out-patient services including investigations to the general public. Currently, the OPD is functioning 10.00 AM to 1.00 PM Monday to Friday except the Govt. Holidays. Its objective was to provide promotive, preventive and curative health care services to people living in urban and peri-urban areas.

Available Human Resources:

Currently available health staff excluding the nonmedical personnel is given below.

- Surgery specialist- 1
- Doctors specialized in community medicine- 2
- Technical assistant- 2
- Laboratory technicians- 2
- Pharmacist- To be recruited

Available Health care facilities:

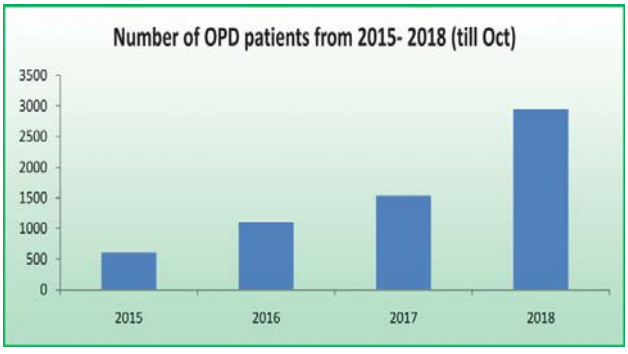
RMRC OPD provides free medical consultations, free diagnostic Services and give free medicines to the needy. It is designated referral facility to carry out investigations for viral diseases such as dengue, Japanese encephalitis, all types of hepatitis and other rare viral diseases. Also it acts as a sputum collection centre for diagnosing tuberculosis using CBNAT. It is also designated as a nodal centre for diagnosis and management of lymphatic filariasis and haemoglobinopathy.

Work Progress

The OPD receives an average 50 number of patients per day. This year (2018) Salia sahi, BDA Chandrasekharpur were severely affected area of dengue fever. In collaboration with Government of Odisha the centre address the diagnostic facilities that develop the strategies for future action to control the outbreak. RMRC proved the excellence in outbreak investigation as well as the main diagnostic centre in all over Odisha. The patient inflow was quite high approximately thrice than previous years. This year

approximately 2950 no. of patients have come to the OPD for consultation. There is also an International Science festival organised at OPD, RMRC by different departments of RMRC for school children. The services offered at the above facility have benefitted the patient and the state health department in diagnosis and treatment of the cases. This also

Patient inflow to OPD for treatment



supported in research activity of the centre which required clinical facility and clinical information that supplemented the laboratory and epidemiological expertise of the centre.

Future Activities

Beside all RMRC OPD is going to start specialised geriatric care unit, lymphadenopathy management, cancer screening centre and Tobacco Cessation clinic very soon at this centre .

Model Rural Health Research Unit (MRHRU), Tigiria

Principal Investigator : Dr. S. K. Palo
Starting date : 31st January 2015
Funding : Extramural (DHR)

Objectives

- To create infrastructure at the periphery for transfer of technology to the rural areas for improving the quality of health services of rural population.
- To ensure an interface between the new technology developers (Researchers in the Medical Institutions; State or Centre), health systems operators (Centre or state health services) and the beneficiaries (communities in rural areas)
- Ensure the much needed geographical spread of health research infrastructure in the rural areas.

Background

Government of India, in June, 2013, approved the scheme for 'Establishment of Model Rural Health Research Units (MRHRUs) in the States' during the 12th Plan period as a path- breaking initiative to develop/strengthen the health research infrastructure in the country to fulfil the newly allocated function of the Department related to the "Promotion, Coordination and Development of Basic, Applied and Clinical Research".

Looking at high incidence of Chronic Kidney Disease (CKD), leprosy, malaria and diabetes MRHRU at Tigiria was established in collaboration with Department of Health & Family Welfare, Govt. of Odisha, Department of Health Research, ICMR-Regional Medical Research Centre, Bhubaneswar and SCB Medical College, Cuttack.

Fig.1: MRHRU Building, Tigiria

Summary of progress

A community based household survey was conducted in Baliput village of Tigiria block, Cuttack. Total 1009 individuals (male=535 & female=474) were interviewed from 237 households. Average age of the individuals was 32.70±19.88 [range: 0.2-95.0] and median of the household annual income was 48,000/- INR.

Fig. 2: Household Survey, Baliput Village.

Among the 1009 study population, 401 (39.7%) were using substances i.e. they consume at least one among smoking tobacco, smokeless tobacco or alcohol. Total 101 (42.6%) households were practicing open defecation, whereas 134 (56.5%) households have access to toilet facility out of which 19 (8%) households use open defecation because of lack of interest to use toilet. The following figure gives the information about ten high prevalent chronic illnesses of Baliput village.

It was also found that total 188 individuals were suffering from chronic diseases out of which 156 (82.98%) individuals were suffering from single disease and 32 (17.02%) individuals were suffering from more than two diseases. Education and marital status are significantly associated with morbidity.

Fig. 3: Information about Chronic Illness.

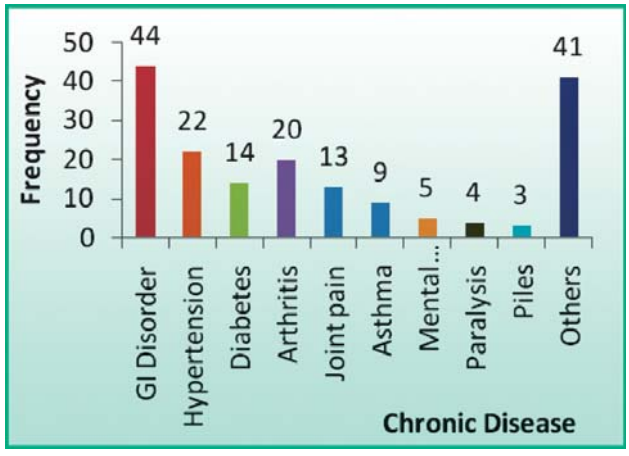


Table 1: Morbidity profile of Baliput village

Variable	Category	Total	Chronic Disease			Chi-Square	p-value
			No n (%)	Single n (%)	=2 n (%)		
Education	Illiterate	285	212 (74.4)	60 (21.1)	13 (4.6)	15.535	0.016
	Primary	251	205 (81.7)	38 (15.1)	8 (3.2)		
	Secondary	357	301 (84.3)	47 (13.2)	9 (2.5)		
	Higher	116	103 (88.8)	11 (9.5)	2 (1.7)		
Marital Status	Unmarried	390	363 (93.3)	25 (6.4)	1 (0.3)	66.562	0.000
	Married	593	442 (74.5)	122 (20.6)	29 (4.9)		
	Widow	26	15 (57.7)	9 (34.6)	2 (7.7)		

Future plan

Based on the study conducted in Baliput village of Tigiria, other studies like Review of health profile and mapping of health infrastructure mapping, Identification of technological and operational gaps and community health priorities are planned to be done in Tigiria block.

Also other activities like screening for oral, breast and cervical cancer, research on chronic diseases like CKD, Cancer; RMNCHA related research projects and others are planned to be held through MRHRU, Tigiria.

Events and Activities in RMRC in 2017-18 (January to December):

- **New Year Day Celebration:** A meeting was held in RMRC auditorium on the occasion of new year day celebration on 2nd Jan. 2018. Dr. Sangamitra Pati , Director, RMRC addressed the staff and scientists and interactive meeting was held on new year day.
- **MRU & MHRU meeting of DHR**:Review Meeting of DHR for MRU & MHRU activities in Odisha was held on 3rd Jan 2017 in the seminar Hall.
- **Secretary DHR and DG, ICMR meeting**: Dr. Soumya Swaminathan, Secretary DHR and DG, ICMR visited RMRC, Bhubaneswar and a meeting was held with Director and all scientists and officers on 17th January 2017.
- **Republic Day Celebration**. RMRC, Bhubaneswar celebrated 68th Republic day of India on 26th January 2017 in its premises. Dr. SanghamitraPati Director, ICMR-Regional Medical Research Centre, Bhubaneswar hosted the tricolor in a colourful function among with all staff of RMRC.
- **M.Sc. Dissertation program-2017:** An Introductory Presentation of M.Sc. Dissertation Students 2017 was held on 27th Jan 2017 in RMRC Seminar Hall for undertaking 6 month project works under various scientists.
- **World Leprosy Eradication Day**: The centre observed World Leprosy Eradication Day on 30th January 2017, Dr. Bikash Ranjan Kar from IMS & SUM Hospital delivered a talk on the topic Early Eradication of leprosy in the seminar Hall.
- **30th SAC Meeting**: ICMR-RMRC, Bhubaneswar conducted 30th SAC meeting successfully on 16th& 17th Feb. 2017. The meeting was chaired by Prof. Indira Chakrabarty. New proposal were discussed and ongoing studies were presented by the respective Person.
- **International Women's Day**: On 8th March 2017 International Women's Day was Celebrated at RMRC Auditorium.
- **TB Awareness Programme:** On theOccasion of World TB Day on 24th march, 2017.

TB Awareness programme was held in the BanphulaBasti, Sikharchandi, Patia and Sikharchandi Project ME School .

- **RMRC Annual Foundation Day:** RMRC celebrated its 36th Annual Foundation Day on 29th march, 2017.
- **Community Interaction Camp:** On the occasion of World Health Day on 7th April, 2017 Community Interaction camp was held at BanphulaBasti, Sikharchandi&Patia.
- **Workshop** : A workshop on "Basics of Clinical Trials" was held in RMRC, Seminar Hall on 8th April, 2017.
- **Training Programme:** EBSCO training programme was held in RMRC seminar hall on 10th April, 2017.
- **Workshop:** Workshop on Multi Skill Training Programme held at RMRC OPD Building from 18th to 25th April, 2017.
- **Workshop:** DHR workshop held in RMRC Seminar Hall from 26th to 28th April, 2017.
- **Workshop:** 3-Day Workshop on Mixed Methods Research was held in RMRC Seminar Hall from

12th to 14th May, 2017. Dr. G. Bulliyya, Scientist-E was the coordinator of the workshop.

- **Introductory Class:** On 23 May 2017 Summer internship student interaction class was held at RMRC Seminar Hall .
- **Community Interaction Camp**: On 31st May, 2017 on the occasion of World No-Tobacco Day; Tobacco awareness Camp was held in the BanphulaBasti, Patia .
- **Certificate Distribution Ceremony:** Pre PhD students Certificate Distribution Ceremony held in RMRC Seminar Hall on 8th June, 2017. ILS Director was the honor of Chief guest.
- **TB Diagnostic Vansflag off Ceremony:** Flag off Ceremony for TB Diagnostic Vans under ICMR-TIE-TB project was held at IPH< Ranchi, Jharkhand on 15th June, 2017.
- **3rd International Yoga Day:** 3rd International Yoga day was being observed in RMRC from 19th to 21st June, 2017.
- **Workshop:** A workshop-cum-Training on Developing and operating Clinical Data Registries held in RMRC Seminar hall from on 22nd& 23rd June, 2017.
- **Workshop:** First Mentoring workshop for C & DST labs for preparatory Activities towards NABL Accreditation was held in RMRC OPD Building from 28th June to 1st July, 2017.
- **APS to MoS (MHFW), Govt. of India meeting**: On 13th July, 2017 Puneet Pradhan, APS to MoS (MHFW), Govt. of India visited RMRC, Bhubaneswar for a meeting with the Director and all the Scientists of the Centre.
- **Research methodology workshop**: An interactive Research Methodology workshop was conducted at MKCG Medical college & Hospital, Berhampur in collaboration with ICMR-RMRC, Bhubaneswar to sensitize the faculties of the Medical College to biomedical research on 6th August 2017. Dr. Sanghamitra Pati, Director, RMRC, Bhubaneswar and Dr. P K Mohapatra, Consultant, RMRC, Bhubaneswar acted as resource persons in this workshop.
- National Nutrition Week Observed in RMRC from 1st Sept- 7th September 2017. Dr. G. Bulliyya, Scientist-E was the coorinater of the program.
- **Hindi Week celebration:** For the promotion of the Hindi, ICMR-RMRC Bhubaneswar celebrated the Hindi week from 7 to 14 September 2017. On the occasion of Hindi week different competitions were organized among RMRC staff and winners were awarded prizes and certificates.
- **Seminar on Plagiarism check**: A seminar was held on 9th September 2017 on Plagiarism check through iThenticate for scientific publications. All scientists and students were present participated the seminar. Resource persons from Turnitin /iTenticate were presented the presentations.
- **Swachh Bharat Abhiyan:** Swachh Bharat Abhiyan cleanness drive in RMRC Campus was organized on 2nd October 2017 and all staff of RMRC participated the Swachhata Mission aviyan.
- **A Training on Web of Science** and Endnote was organized on 13th October 2017 by Clarivate Analytic, New Delhi for RMRC scientists and staff for use of reference management software " ENDNOTE" anf also access of Web of Science trial access through ICMR consortia.
- **Global Hand Washing Day & Mental Health Day Observation:** A team of RMRC scientists and technical staff visited the urban slum " Ban FulBasti, patia" for demonstration of hand washing practice on 15th Oct. 2017. In addition to that a Psychiatrist (Medical) from KIMS, Bhubaneswar was accompanied with us for mental health check-up of urban slum people.
- **A Walkathon** from RMRC to Damana Square was organized on the eve of RastriyaEktaDiwas

on 31st Oct. 2017. T- Shirt with ICMR logo was unveiled on this occasion and distributed to the staff before starting mini walkathon " Run for Unity".

- **Workshop on Systematic Review & Meta-analysisin Healthcare** was organized on 24-26 November 2017 by RMRC, Bhubaneswar where 35 participants from various medical colleges and research organizations of the country participated. Dr. Debdutta Bhattacharya was the coordinator of the workshop and Dr. Soumyadeep Bhwmik, Kolkata was the resource person.

Guest Lecture:

1. Dr.KasturiHaldar, Professor of Biological Sciences, University of Notre Dame delivered a guest lecture on*"Molecular Biology of falciparum Malaria"*on 6th Jan 2018 in RMRC seminar Hall.
2. Dr. M.M. Parida Scientist-G, DRDO Gwalior delivered a guest lecture in RMRC seminar hall on the topic "Advances of molecular techniques for Clinical diagnosis of emerging viral infections" on 7th March 2017.
3. Dr. Sangita Mukhopadhya , Head , Molecular Biology Group, Laboratory of Molecular and Cellular Biology , Hyderabad given a guest lecture on "Manipulation of Macrophage function by Myco-bacterium Tuberculosis: An approach to the identification of novel drug targets" on 21st April 2017.
4. Dr. Rabindra Kumar Barik, Associate Prof., KIIT, Bhubaneswar had delivered a talk on Application of GIS in Medical research on 8th Sept. 2018.

Patent filed (Under process).

BrindaChandar, Mohan Kumar Ramasamy, Debdutta Bhattacharya, SanghamitraPati. *NEW DELHI METALLO-B-LACTAMASE 1* INHIBITORY COMPOUNDS FROM *COMBRETUM ALBIDUM.*

Meeting attended by RMRC Scientist

Dr. Sanghamitra Pati, Director

1. Participated National Seminar on Pupulation and Health in the context of sustainable development goals from 11th-13th January 2017 at BBSR, organized by IIPS in collaboration of NabakrushnaChaudhury Centre for Development Studies (NCDS).
2. Participated Advocacy Programme under LEPRA Vihaan Project, Odisha on 25th January 2017 at the Conference Hall, Heads of Departments, Govt. of Odisha, Bhubaneswar.
3. Chaired a session in Interactive Session of "Forging Partnerships in Research for Social Development at Hotel Swasti Premium on 10th February 2017 (6:00 PM), organized by ILS, Bhubaneswar.
4. Attended a meeting on Odisha Health Strategy organized by Health & Family Welfare Department, Government of Odisha on 10th February 2017 at 9:30 AM to 4:00 PM.
5. Attended the State Technical Task Force-Cum-Review meeting on Vector Borne Disease Control Programme on 15th February 2017(10:30 AM) at DHS Conference Hall, Bhubaneswar.
6. Invited as a Guest Lecturer of Global Sickle Cell Congress at Hotel MyFairw.e.f. 21-23rd February 2017 .
7. Attended Malaria & other VBD Control Programme organized by Addl. Secretary and MD, NHM, MOH & FW on 21st February 2017 (10:30 AM) at NHM Conference Hall.
8. Participated VBD Conference in Chennai w.e.f. 26th-1st March 2017 and delivered a lecture on "Health Promoting School Model Interventions for Prevention of Vector Borne Diseases in Odisha, India.
9. Visited DHR, New Delhi, ICMR and attended and TB strategy meeting in New Delhi on 2nd March 2017.

10. Delivered a lecture in Palliative Care Training Programme Department of Anaesthesiology, Pain Relief and Palliative Care & Plastic Surgery at AIIMS, Bhubaneswar w.e.f. 5th-6th March 2017. Organised in collaboration with NHM & NCD Cell Odisha.
11. Invited to participate in the panel discussion at ILS, Bhubanewar on the occasion of International Women's Day on 8th March 2017.
12. Invited as a Chief Guest to grace on the occasion of International Women's Day at Institute, Synergy Institute of Technology, Bhubaneswar on 8th March 2017 at 3:00 PM.
13. Attended Steering Committee of Heat Wave Action Plan at the Conference Hall of Odisha State Disaster Management Authority on 9th March 2017.
14. Acted as Chief Guest on the occasion of World TB Day Function on 24th March 2017 at ATD &TC, SCB Medical College,Cuttack.
15. Attended as one of the member of Working Group for NPCB Review Meeting at National Health Mission (NHM), Nayapalli, Bhubaneswar on 30th March 2017.
16. Invited speaker in ICAR International Centre for Foot and Mouth Disease (ICFMD). The State of art High Containment of BSL3Ag Laboratory Facility on 1st April 2017.
17. Attended the on planning a Regional Centre of Research Excellence (RCFE) in Non-Communicable Diseases (NCD) in India. Organised by Public Health Foundation of India Office, Gurugram on 2nd April 2017.
18. Attended SRC meeting in the Seminar Hall of AIPH, Bhubaneswar on 5th April 2017.
19. Attended State Technical Task Force-Cum-Review Meeting on NVBDCP on 26th April 2017 at DHS Conference Hall, Govt. of Odisha.
20. Attended the Odisha Livestock Development Society (OLDS), Bhubaneswar Chapter celebrated "World Veterinary Day (WVD) at Odisha Veterinary Council Hall, Sahid Nagar on 29th April 2017.
21. Attended Celebration of World Veterinary Day at M.S.Swaminathan Hall, OUAT, Bhubanswar on 29th April 2017.
22. Attended Research & Ethics Committee Meeting in the Conference Hall of Health & FW Department, Govt. of Odisha on 5th May 2017.
23. Attended ICMR-IITKGP MedTech Internship 2017 at IIT Khadagpur on 11th-12th May 2017.
24. Member of an expert committee to deliberate on integration of agriculture and nutrition from demonstration freedom from hunger in 3 districts Gorakhpur (UP), Koraput (Odisha) and Thane (Maharashtra). 8th May 2017.
25. Expert Committee member to assess the impact of integration of nutrition and agriculture to achieve freedom from hunger. To begin with the model intervention may be tested in 3 districts, i.e. Gorakhpur (UP), Koraput (Odisha) and Thane (Maharashtra). Director General, ICMR constituted committee on 8th May 2017.
26. Mixed method research Workshop conducted at RMRC, Bhubaneswar on 12th -14th May 2017.
27. Dissemination workshop on " curbing child under- nutrition through pustikarDewas A Study on effectiveness of the program" at Bhubaneswar at 11.00 AM on 15th May 2017.
28. Inter-sectoral coordination meeting on Vector Borne Diseases and water Borme Diseases Particularly Dengue & Diarrhoea at 2nd floor conference hall of Odisha Secretariat at 3.30 PM on 19th May 2017.
29. Strengthening MMDP Component of ELF through Research meeting on 22nd May 2017 at 10.30 AM in the committee room of ICMR.
30. Assessment Committee Meeting Of ILS at 10 AM on 27th May 2017.
31. State level coordination and Advocacy meeting on Tobaco Control on 31st May 2017 at IMA institute at 10.30 AM.

32. Selected a member of a committee constituted under the Chairmanship of Director, Medical Education and Training, Odisha to discuss, deliberate and offer their views on implementation of Rice Fortification Project to other district as suggested Women & Child Development Department and School & Mass Education Department on 2nd June 2017.
33. Participated at the centre for Environmental Health's Consultation on World Environment Day at India Habitat Centre, New Delhi on 5th June 2017.
34. Attended the meeting on Soil transmitted helminthes at ICMR Hqrs from 10.30 AM on 6th June 2017.
35. Nominated as a member of Committee to look into different aspects of publication of an International Standard Peer-reviewed Research Journal in Science by Odisha State Council on Science & Technology (OSCOST) on 5th July 2017.
36. Selected a member of Research Advisory Committee (RAC) for Multi Disciplinary Research Unit (MRU) of SCB Medical College, Cuttack.
37. Invited as a chief guest on the occasion of the installation ceremony of Rotary Club, Bhubaneswar on 8th July 2017.
38. Attended ICMR Tax force study on fluorosis work shop on 11th -12th 2017 at the conference hall of ICMR.
39. Attended 1st workshop on writing policy briefs at New Delhi on 24th-25th July 2017.
40. Attended of the committee for implementation of Rice Fortification Project in Odisha at the conference hall of DHS, Govt. of Odisha on 27th July 2017.
41. Attended Bioresources for Sustainable Development Biodiversity/ Agriculture/ Health on 31st July 2017 at crystal hall Mayfair convention centre, BBSR.
42. Participated CME and workshop on research methodology at MKCG Medical College Berhampur on 6th August 2017.
43. Delivered a lecture on International Collaboration for Global Health the US perspective on 19th September 2017 at ICMR conference hall, New Delhi through ECHO.
44. Participated *line survey for consensus building research agenda* for NCD's control and prevention at PHFI office in Gurgram on 10th October 2017.
45. Attended AHRCC-IEC meeting at seminar hall of department of radiotherapy, AHRCC, Cuttack on 21st October 2017.
46. Participated International conference on Translation Neurosciences and its application in protection of Mental Health on 29th October 2017 organized under the auspices of department of Zoology school of life science, Ravenshaw University Cuttack.
47. Attended Research & Ethics committee meeting at the conference hall of H & FW Department, Govt. of Odisha on 8th November 2017.
48. Particpated 16th Annual General Body Meeting of ILS on 11th December 2017 through video conferencing under the chairmanship of Hon'ble union Minister of Science & Technology and Earth Science, Govt. of India.
49. Attended protocol development workshop on 13th-14th December 2017 at ISID Campus, vasantkunj, New Delhi organized by Campbell Collaboration.
50. Attended workshop on malaria vector control in India at TERI office in India Habitat Centre, Lodhi Road, New Delhi on 18th December 2017.

Dr. N. Mahapatra, Scientist-F

1. Participated ZIKV Training From 6th to 11th February, 2017 at ICMR-Vector Control Research Centre, Puducherry .
2. Presented a paper entitled "A geo-spatial modelling for mapping of filariasis transmission risk in Odisha using remote sensing and GIS" at symhealth2017. Organized by Symbiosis International University, Pune for SYMHEALTH 2017 during 4-6 May, 2017.

3. Attended the training programme on RS and GIS based technologies for decision makers from 12-15th June, 2017 at IIRS-ISRO Derahadun.
4. Attended "Esri India User Conference 2017 and Exhibition, held at The Leela Ambience Convention Hotel, Delhi on December 13-14, 2017 with a theme "GIS: The Science of Where".

Dr. M. R. Ranjit, Scientist-F

1. Invited for a Guest Lecture at PG Department of Zoology, Utkal University on 20th Jan 2017 organized for around 45 Degree College Lecturers of Odisha, Maharashtra, Chhattisgarh and West Bengal.
2. Invited as Guest speaker on the Workshop on "Funding Opportunities and Grant writing tips for Biotechnology Innovative Ideas" on 23rd January, 2017 at KIIT-TBI, KIIT University
3. Invited as Guest speaker in the National Symposium on "Environmental Impact on Human Life" organized by PG Department of Zoology, Ravenshaw University, Cuttack on 28th Jan 2017
4. Delivered a Guest lecture on "Severe malaria: Can NO be used as adjunct therapy" on 7th Feb 2017 at ICMR-CRME, Madurai as a part of EMBO-Global Lecture Series on Life Science.
5. Organized the 13th Annual meeting of NAVBD and Conference on Vector and Vector borne Diseases in collaboration with Central University of Tamilnadu, Thiruvarur at Chennai from 27th February to 1st March 2017 on the theme Novel Technologies: Renewed Hopes for Elimination.
6. Attended the 13th Conference on Vector and Vector borne Diseases organized by NAVBD and CUTN, Thiruvarur at Chennai from 27th Feb to 1st March 2017 and presented the paper as Guest speaker on "Molecular Genetics of Severe Falciparum Malaria"
7. Delivered a Guest lecture on 5th May 2017 on "Recent Developments in Malaria Diagnostics and future perspective" to the National Trainees on Molecular Biology & Biotechnology organized by at ICAR-CIFA from 15th Feb to 15th May 2017.
8. Participated as Invited Guest in the 2017 Next Gen Genomics, Biology, Bioinformatics and Technologies conference during 2nd- 4th October 2017 at May Fair Convention Centre, Bhubaneswar, Odisha, India.
9. Acting as Guest Editor for the special issue on Vector Borne Human Infections: Changing Epidemiology and Vaccine Development of the journal "Canadian Journal of Infectious Diseases and Medical Microbiology" to be published in June, 2018.

Dr. A. K. Satapathy, Scientist-F

Dr A K Satapathy Participated in the 2017 NextGen Genomics, Biology, Bioinformatics and Technologies (NGBT) Conference from 2nd -4th October 2017 held in Bhubaneswar, Odisha.

Dr. B. B Pal, Scientist-F

1. Attended and presented the paper on "Sequential outbreaks of cholera due to Haitian variants of ***V. cholerae*** O1 in Odisha" the 41st Annual Conference of Indian Association of Medical Microbiologists (*MICROCON*) on 22nd -26th November, 2017, RIMS, Ranchi.
2. Attended the 14th International Conference on Diarrheal Disease & Nutrition (ASCODD) from 30th Oct-1st Nov., 2017 at Kochi, India; presented the paper "Endemicity of cholera in Odisha, India."
3. Attended and presented a talk on "Present scenario of cholera in eastern region of India" at "29th All India Congress of Zoology" held on June 2017 at ICAR-CIFRI, Barrackpore, Kolkatta-120.
4. Attended and presented a talk on the occasion of platinum jubilee celebration in ICAR-CIFRI, Barrackpore, Kolkatta-120 on "Prevention and control of cholera in Odisha, India." held on December 2017.
5. Attended a technical meeting at state forensic laboratory held on August 2017.

Dr. T. Hussain, Scientist-E

1. Participated final project review meeting of TB-Tribal Task force project on 25th July,2017 at Hotel Ambassador Pallava, Egmore, Chennai.
2. Attended Workshop on Developing Protocol for Cochrane Systematic Review for Health Care Professionals on 26th-28thOct.2017 at the Institute of Dental Sciences, Shiksha 'O' Anusandhan University, Bhubaneswar.

Dr. D. Das, Scientist-E

1. Attended workshop on Delamanid introduction under PMDT from 30.1.2018 to 1.2.2018 at New Delhi.
2. Attended Third party evaluation of Tuberculosis Laboratory Diagnostic Network under RNTCP debriefing meeting at Delhi on 30th &31st October 2017.
3. Attended Third party evaluation of Tuberculosis Laboratory Diagnostic Network under RNTCP closure meeting at Delhi on 9th & 10th November 2017 at Delhi.
4. Attended workshop and annual THRF meeting at NIRTH, Jabalpur on 16th &17th August, 2017
5. Attended the RNTCP programme review meeting of NE states at Guwahati on 25-26 July 2017.
6. Attended Pre SAC review meeting of NIRT, Chennai on 6th & 7th July, 2017
7. Attended Velos training programme from 14.6.2017 to 16.6.2017 at ICMR, New Delhi
8. Training of Internal Auditors and Quality Management Systems (IA&QMS) from 24-27 May 2017 at NITRD, Delhi
9. Attended Expert Committee on TB diagnosis at ICMR, New Delhi on 18.4.2017.
10. Attend the National Training of Trainers for expansion of Bedaquiline& shorter MDR TB regimen with updated guidelines for PMDT in India held from 5.4.2017 to 7.4.2017 at Guwahati, Assam
11. Attended the meeting on National Strategic Plan for TB Control in India (2017-23) at Delhi on 1st March 2017

Dr. Gandham Bulliyya, Scientist-E

1. Attended 13th State-level Steering-cum-Monitoring Committee Meeting of Mid-Day Meal Programme held at Conference Hall of Planning & Convergence Department, Bhubaneswar on 05th January 2017.
2. Attended National Consultative Meet for Development of the Mobile APP for Indian Food Composition Tables (IFCT 2017) held at National Institute of Nutrition, Hyderabad on 13th February 2017.
3. Attended National Seminar on Genomics and Cultural variation of Indian Populations: An Appraisal of Health and Disease Susceptibility, held at Sri Venkateswara University, Tirupati and presented a paper as invited speaker "Triple burden of malnutrition in India: a vicious intergenerational life cycle" on February 23-24, 2017.
4. Attended 14th State-level Steering-cum-Monitoring Committee Meeting of Mid-Day Meal Programme held at Conference Hall of Planning & Convergence Department, Bhubaneswar on 04th February 2017.
5. Participated in 'A 3-Day Workshop on Monitoring and Evaluation for public health and development professionals' held at IIPH, Bhubaneswar from 08-10th March 2017.
6. Participated in UNICEF state meeting held at UNICEF Bhubaneswar office on 6th April 2017.
7. Organized 'A 3-Day Workshop on Mixed Methods Research Designs" organized at RMRC seminar hall, Bhubaneswar from May 12-14th 2017.
8. Attended 15th State-level Steering-cum-Monitoring Committee Meeting of Mid-Day Meal Programme held at Conference Hall of

Planning & Convergence Department, Bhubaneswar on 05th May 2017.

9. Presentation on Concurrent Monitoring and impact evaluation of Mid-day meal Programme in odisha held at Office of Commissioner-cum-Secretary, School & Mass Education Department, Govt.of Odisha on 20.5.2011.
10. Attended Workshop on ICMR Task force study Iodine Deficiency Disorders held at ICMR Headquarters, New Delhi from 28th-29th June 2017.
11. Attended workshop on ICMR Task Force Study "Prevalence of Fluorosis in the community of selected districts of India and development of an appropriate intervention model for prevention and control of fluorosis" held at ICMR Headquarters, New Delhi from 11th & 12th July 2017.
12. Attended 15th Annual Project review of Generating Advances in Income and Nutrition through Sweet potato (GAINS) organized by International Potato Centre, Bhubaneswar on 21st July, 2017.
13. Attended a National Consultation on "Bioresources for Sustainable Development: Biodiversity-Agriculture-Health" organized at Science Outreach Centre, Institute of Life Sciences (ILS), Niladrivihar, Bubaneswar during August 1-2, 2017.
14. District level Consultation Workshop on Developing Intervention Strategies to address problem of under-nutrition and hidden hunger at Collectorate, Koraput.
15. State-level Dissemination Seminar on NFHS-4 2015-16 Survey held at RMRC Auditorium Bhubaneswar.
16. 11th Common Review Mission Meetings held on 2nd, 3rd at New Delhi, on 4th at Ranchi, 4th at Pakur and on 10th at Ranchi.
17. Attended Cost-cum-Nutrition Committee on implementation of fortification project in 15 tribal districts under MDM scheme held at School and Mass Education, Govt of Odisha on 16th Decemeber, 2017.

Dr. Amarendra Mahapatra , Scientist-E

1. Attended Indian Science Congress Association National Seminar on Reaching the Unreached Through Science & Technology held at KIIT University, Bhubaneswar, Odisha on 18-19 Dec. 2017.
2. Attended National Symposium on Tropical Meteorology Climate change and Coastal Vulnerability at Hotel Mayfair Convention, BBSR, Odisha on 18-21 Dec, 2016.
3. Attended 39th Annual Meet and Conference of Institute of Indian Geographers (IIG) on Population, Environment and Sustainable Development at Department of Applied Geography, Ravensahw University, (Odisha) 26th- 28th Dec, 2017.
4. Attended 43rd all India Sociological Conference of Indian Sociological Society (Neo-Liberalism, Consumption and Culture) held at Department of Sociology, Utkal University, Odisha on 9 -12 Nov, 2017.
5. Good Practices in Tribal Development with special Reference to PVTGS at SCSTRTI,BBSR held on 19-20 Aug,2017

Dr. R.K Hazra, Scientist-E

1. Attended 13th NAVBD conference on vectors & vector borne diseases at Chennai from 27th February to 1st March 2017.
2. Presented e-poster on "Transfer of a Molecular Technique from Laboratory to Field for mapping of malaria vectors and their vectorial attributes." and participated in discussion on translational research held at RastrapatiBhawan, New Delhi in April 2017.
3. Organized a Hands-on-training on Indoor Residual Spray at Kalahandi Field Unit, RMRC, held on 18th and 19th June, 2017.

4. Attended National Briefing workshop at New Delhi on 3rd November 2017.
5. Represented as an expert review member in 11th Common Review Mission of NHM held at Kolkata from 4- 11 November, 2017.
6. Attended 10th National Conference on Vector Borne and Zoonotic diseases, Ashutosh College, Kolkata, held on 8th and 9th December, 2017.
7. Attended a workshop on Biological control of malaria vectors under India-Michigan State University Partnership held at TERI, New Delhi on 18th December, 2017.

Dr. M. S. Bal, Scientist-C

1. Attended the Workshop on "Funding Opportunities and Grant writing tips for Biotechnology Innovative Ideas" on 23rd January, 2017 at KIIT University.
2. Attended the 13th Conference on Vector and Vector borne Diseases organized by NAVBD and CUTN, Thiruvarur at Chennai from 27th Feb to 1st March 2017 and presented the paper on "Maternal filarial infection influences the development of regulatory T cells in children from infancy to early childhood
3. Attended the 2017 Next Gen Genomics, Biology, Bioinformatics and Technologies conference during October 2nd – 4th, 2017 at May Fair Convention Center, Bhubaneswar, Odisha, India.
4. Participated in the "Workshop on Developing Protocol for Cochrane Systematic Review for Health care Professionals" organized by Institute of Dental Sciences, Siksha Ò' Anusandhan University held on 26th to 28th October 2017.

Dr. D. Bhattacharya, Scientist-C

1. Technical partners meeting on Health Technology Assessment on 22nd December, 2017 at Dept. of Health Research, Govt. of India, NirmanBhawan, Red Cross Building, New Delhi.
2. Attended CDC funded hands on training programme conducted by Manipalcentre for Virus Research, Manipal on Laboratory Diagnosis of Scrub Typhus &Rickettsial Diseases during 17-19th January, 2017.
3. Invited as Honourable speaker in ICMR sponsored national seminar on "Scientific validation and technical evaluation of herbal products in the present era" at Indira Gandhi Institute of Pharmaceutical Sciences, Bhubaneswar, Odisha and delivered a lecture on "Antibiotic Resistance- an urgent need for alternate" on 4th March, 2017.
4. Attended CDC funded hands on training programme conducted by RIMS, Ranchi, on Laboratory Diagnosis of Anthrax during July, 2017.
5. Participated Media training workshop organized by Communications Unit, ICMR on 2nd November, 2017 at Institute of Pathology, New Delhi.

Dr. Gaurav Raj Dwivedi, Scientist - C

1. Attended 3 days CDC funded Anthrax Diagnostic Training at RIMS, Ranchi from 12th to 14th July, 2017.
2. Attended 3 days (31 July-2 August 2017) National Consultation on Bioresources for Sustainable Development: Biodiversity-Agriculture-Health organized by Institute of Life Sciences (ILS), Bubaneswar.
3. Attended the project proposal review committee meeting at Indira PrayavaranBhawan, Ministry of Environment, Forest and Climate change office in New Delhi 20th September, 2017.
4. Attended 5-days (09-13 October 2017) Biorisk Management Training Workshop being jointly organized by Centers for Disease Control & Prevention (CDC), India and Integrated Quality Laboratory Service (IQLS).
5. Attended 4 days (13-16 December 2017) Rajasthan Conclave-5 organized by ICMR-Desert Medicine Research Centre (DMRC), Jodhpur.

Dr P. K. Sahoo, Scientist - B

1. Participated the meeting to discuss "The SOP, timeline and other logistics of the multi centric sero-surveillance project" organized by National Institute of Epidemiology, Chennai on 21st July' 2017.
2. Participated the workshop on "Preparedness and Response for AES, JE and Encephalopathy" organized by NVBDCP, Govt. of Orisha on 2nd-3rd Aug'2017 at SLN Medical College, Koraput, Odisha.
3. Participated in training programmes for Nominees of CPCSEA organized by Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Ministry of Environment, forest and climate change, Government of India, New Delhi from 6th -7th Dec, 2017.

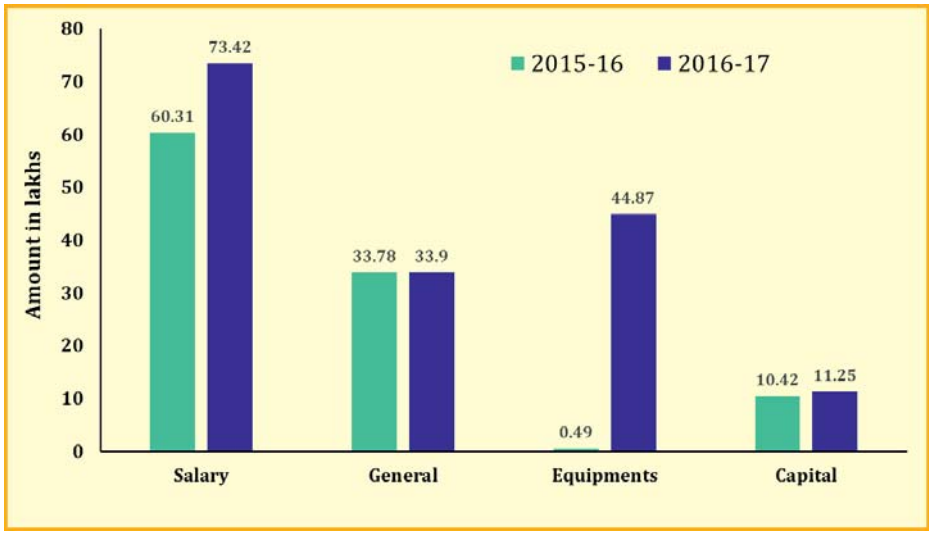
Dr. B. Sahoo, Lib & Inf. Officer

1. Participated Media training workshop organized by Communications Unit, ICMR on 2nd November, 2017 at Institute of Pathology, New Delhi.

Paper presented by students in conference:

1. Praharaj Ardhendu Bhusan, et al (2017). Role of Vegetarian Diet in preventing diabetes in population practicing sedentary lifestyle: A case study in Eastern region of India. Presented at NextGen Genomics, Biology, Bioinformatics and Technologies (NGBT) Conference on 2nd - 4th October 2017, Bhubaneswar, Odisha, INDIA.
2. SmaranikaPattnaik, Santosh Kumar Behera, NamitaMohapatra (2017). Homology modeling of FtsZ protein from virulent bacterial strains and its interaction with Eucalyptol: An Insilico approach for therapeutics. Presented at NextGen Genomics, Biology, Bioinformatics and Technologies (NGBT) Conference on 2nd - 4th October 2017, Bhubaneswar, Odisha, INDIA.
3. Truptirekha Panda, Budheswar Dehury, Namita Mohapatra (2017). Insights into the mode of recognition of DIII of dengue E protein with GRP78: A molecular dynamics approach Presented at NextGen Genomics, Biology, Bioinformatics and Technologies (NGBT) Conference on 2nd - 4th October 2017, Bhubaneswar, Odisha, INDIA.

Budget details for the year 2016 & 2017



Total Extramural Grants : 6.92 crore

31th Scientific Advisory Committee

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(As on 31st March 2018)

Sl No.	Name of employees	Designation
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12.	Dr. B. Dwibedi, M.B.B.S. , M.D.	Scientist-E *(On Lien)*
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14.	Dr. D. Bhattacharya, M.Sc. , Ph.D.	Scientist-C
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16.	Dr. G. R. Dwivedi, M.Sc. , Ph.D.	Scientist-C
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31 October, 2017

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