वार्षिक प्रतिवेदन
Annual Report
2016-17

NIRTH Jabalpur

विश्व स्वास्थ्य संगठन
जनजातीय स्वास्थ्य के लिए सहयोगी केंद्र

आई.सी.एम.आर.–राष्ट्रीय जनजाति स्वास्थ्य अनुसंधान संस्थान
जबलपुर (म.प्र.)

ICMR-National Institute for Research in Tribal Health
Jabalpur (M.P.)

Cover Front Page: A Baiga tribal women from Dindori District of Madhya Pradesh.

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ICMR-National Institute for Research in Tribal Health
Jabalpur (M.P.)

Preface

It gives me immense pleasure to present the activity report of NIRTH for the period 2016-17. I took over as Director of NIRTH in the month of August 2017 and during this short period, I felt the vastness of the capacity of the institute and the possible areas of exploration. I express my pleasure and privilege to serve this esteemed ICMR institute which is exclusively working on Tribal Health for more than 33 years. I express my heartfelt gratitude to Dr. Neeru Singh, the former Director and a versatile leader who excelled this Institute to the epitome of success in establishing this scientific facility. Her demise has created a vacuum in the scientific arena which all of us has felt from within. I would also like to express my thankfulness to all other Directors/leaders of this Institute, whose contributions compounded to shine the Institute as it is today. Lastly, but not least I express my deep appreciation for the scientists who are the backbone of this institute for their remarkable research contributions, publications in highly peered reviewed journals such as- The Lancet, Plos One, TMIH, IJMR etc., but also for their networking in research and capacity building with government and private sector stakeholders.

During the period under report, the institute has initiated quite a number of promising research projects of public interest with funding from reputed national and international agencies. The institute is also pioneering in academic activities as many students are pursuing their PhD and also completed the M.Sc dissertation under the guidance of the eminent scientists of this institute. The institute also organized different seminars, trainings and meetings in collaborations with Universities, government organisations and NGOs.

I place on record my sincere gratitude to the SAC members of NIRTH and Dr. Soumya Swaminathan, Secretary, DHR & DG, ICMR for their constant support and guidance.

Lastly, I feel from the core of my heart that with the expansion of NIRTH as National Institute, our responsibility for doing good work and reaching the research benefits to the target population has increased many folds and we will do our best to excel to the expectations.

Dr. Aparup Das
Director

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Division of Communicable Diseases

Division of Communicable Diseases works on major infectious diseases mainly on Tuberculosis. It is engaged in community based studies as well as laboratory research. TB laboratory has all the modern diagnostic modalities and is supporting the national TB control programme. The division has initiated intervention program among Saharia tribal group to reduce the burden of TB among them. The division also has State Reference Laboratory (SRL) and Integrated Counseling and Testing Centre for HIV.

Dr. V.G. Rao is an epidemiologist with wide range of experience on various communicable diseases especially tuberculosis. He has worked extensively on tuberculosis in Saharia tribe and have initiated intervention studies among them.

Dr. Jyothi Bhat is a medical microbiologist, working in the area of tuberculosis since last few years. Her aim is to contribute to reduce the burden of tuberculosis among tribal population.

Dr. Rajiv Yadav is a medical scientist with research interest in sickle cell disease and tuberculosis. He has worked extensively on sickle cell disease and looks after the sickle cell clinic of the institute.

1. COMMUNICABLE DISEASES

1.1. MULTI-CENTRIC COHORT STUDY OF RECURRENCE OF TUBERCULOSIS AMONG NEWLY DIAGNOSED SPUTUM POSITIVE PULMONARY TUBERCULOSIS PATIENTS TREATED UNDER RNTCP

Principal Investigator	:	Mohan Natrajan, NIRT Chennai
PI at NIRTH	:	Dr. V. G. Rao
Status	:	Completed
Funding	:	Central TB Division, Govt. of India

The primary objective of the study was to estimate the recurrence of TB among newly diagnosed sputum positive pulmonary TB patients who have been successfully treated under RNTCP. The other objectives were to distinguish between relapse and re-infection among those who have recurrence of TB; to identify risk factors for unfavourable treatment outcomes (treatment failed, lost to treatment follow-up and died), and recurrent TB among newly diagnosed sputum positive pulmonary TB patients who have been successfully treated under RNTCP.

The estimated sample size was 1,200 new smear positive pulmonary TB patients from six sites (200 each) treated under RNTCP. Two districts were selected for each institute based on convenience (one rural and one urban district), and one Tuberculosis Unit (TU) from each district, that had enrolled at least 150 new smear positive pulmonary TB patients in the previous two quarters. New smear positive pulmonary TB patients initiated on treatment during two consecutive quarters in the selected TUs form the study population. The inclusion criteria were - smear positive pulmonary TB patients who have not received or have received less than one month of previous anti-TB treatment; adult patients aged >18 yrs; residing within the selected TU area; willing for study procedures; willing to give written informed consent. Of the above enrolled cohort of patients, those declared “treatment success” (cured + treatment completed) formed the study population to estimate recurrence of TB and were followed up for a period of 12 months after completing treatment. The risk factors were analysed among those with unfavourable outcomes to treatment (treatment failed, died, lost to treatment follow-up) at the end of treatment and recurrence of TB. The study procedures included structured interview, sputum examination for TB smear, culture, drug susceptibility tests (DST), genotyping at NIRT, Chennai and blood tests for diabetes mellitus and HIV infection.

The study was conducted in two districts viz. Jabalpur (urban) and Mandla (rural). A total of 121 new smear positive pulmonary TB patients enrolled from each of these sites (total 242) were subjected to the structured interview, sputum examination for smear, culture & DST and blood tests for diabetes mellitus and HIV infection. Of these, 157 cases were declared cured/treatment

completed and was followed up for recurrence of tuberculosis. A total of 76 cases had unfavourable treatment outcomes (died (22), loss to treatment follow up (14), treatment failure (40) during the course of the treatment. Nine cases of MDR-TB and three cases of HIV-TB were also detected and were referred for treatment. Of the cured 157 cases, recurrences of TB were observed in 39 (24.8%) individuals and were referred for treatment under RNTCP (Table 1.1.1 & Figure 1.1.1).

Risk factors for unfavourable response at end of treatment and for TB recurrence were analysed using pooled data from all the six participating sites. None of the factors analysed were associated with unfavourable response to treatment. Of all the factors analysed in patients with treatment success, being male (ARR= 2.4; 95%CI 1.3-4.6; p =0.006) was associated with TB recurrence. TB recurrence was mainly due to endogenous reactivation suggested by genotyping findings in the study.

Table 1.1.1: Status of TB patients under selected sites

Study site	No. of Patient Enrolled	Unfavourable Treatment Outcome			Cured/ Treatment Complete	Recurrence (in Months)			
		Died	Failure	Loss to T /t Follow up		3rd	6th	12th	Total
Jabalpur	121	04	20	11	84	08	07	04	19
Mandla	121	18	20	03	73	12	05	03	20
Total	242	22	40	14	157	20	12	07	39

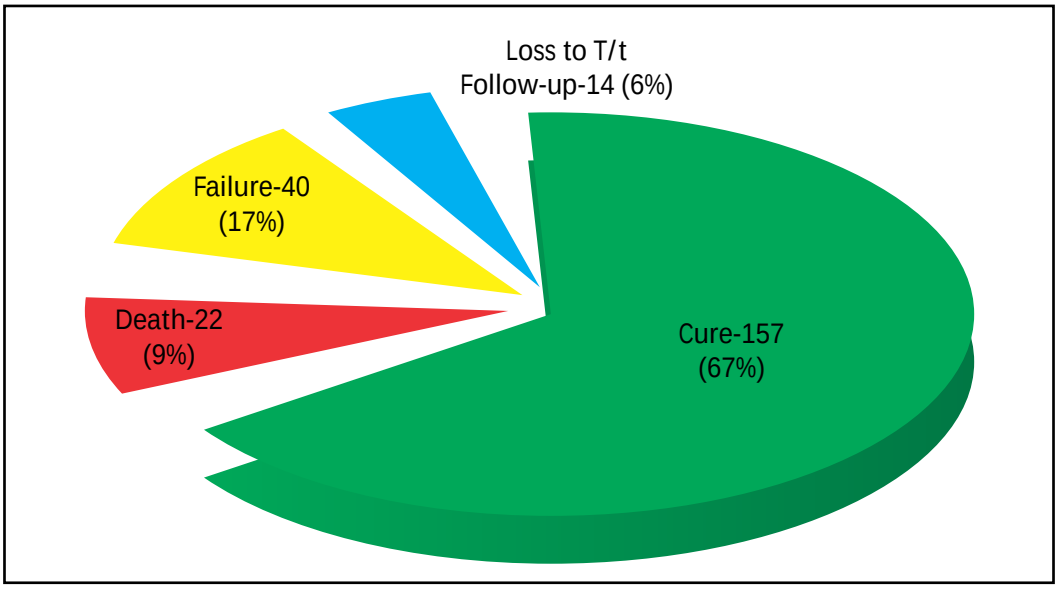


Figure 1.1.1: Treatment outcomes (N=233)

This is the first study which has attempted to determine the TB recurrence rates of 6 month thrice-weekly regimen across different geographical locations under program settings in India. Though the overall cure rate in all the study sites was 77%, it was lower (67%) at Jabalpur site. This is lower compared to the RNTCP target of 90%. A very high failure (17%) and death rates (9%) observed at this site warrants further evaluation. No risk factors were identified for unfavourable response to treatment in the present study. The study findings at this site show high TB recurrence of 24% with 82% of the recurrences occurring within 6 months post-treatment. Being male was more likely to be associated with TB recurrence in the study which is mainly due to endogenous reactivation suggested by the genotyping findings. This reflects poorly on the efficacy of the regimen under program settings in its ability to offer a relapse free cure.

The study findings suggest that a significant proportion of successfully treated new smear positive pulmonary TB patients have TB recurrence under program settings. The observed high unfavourable responses to treatment and TB recurrence need to be studied in detail for possible reasons and to plan relevant interventions.

The study suggests that a significant proportion of successfully treated new smear positive pulmonary TB patients have TB recurrence under program settings.

1.2. ESTIMATE THE BURDEN OF TB AMONG THE TRIBAL POPULATION AND DEVELOP AN INNOVATIVE HEALTH SYSTEM MODEL TO STRENGTHEN TB CONTROL IN THE TRIBAL AREAS

Principal Investigator	:	Beena Thomas, NIRT Chennai
PI at NIRTH	:	Dr. V. G. Rao
Status	:	Completed
Funding	:	ICMR (under TSP)

TB is a major public health problem in the country, albeit information on the TB situation amongst the tribal population is limited. In view of this, present study was planned to generate community-based primary data on tuberculosis prevalence amongst the tribal population in the country and the challenges in access to health care services and the factors that influence their health care seeking behaviour. The findings would serve as a baseline for future follow-up surveys at regular intervals. This study was a part of the national level multi-centric ICMR task force study on tuberculosis under tribal sub-plan. The NIRTH, Jabalpur covered the clusters in Madhya Pradesh and the study area included randomly selected clusters in tribal dominated districts in the state.

The broad objectives of the study were to estimate the prevalence of TB amongst tribal groups in various states of the country; to find out the health seeking behaviour patterns of persons having symptoms suggestive of TB; and to develop feasible interventions to improve case finding and compliance for TB treatment through a community based approach.

The required sample size for TB prevalence survey was estimated to be about 63,480 adults aged ≥15 years selected from 84 clusters for an assumed prevalence of 387/1,00,000 bacteriologically positive PTB cases with a precision of 15% at 95% confidence level, a design effect of 1.3, and missing or non-response of 10%. Tribal villages with tribal population >70% formed the sampling frame for selection of villages. From the sampling frame, the average cluster size (of adults) was found to be 756. A total of 16 clusters selected in Madhya Pradesh were covered in the study. The detailed plan was as under:

1. Phase I - Situational analysis

This included collection of the secondary data with respect to health facilities available, the distances between health facilities, the staff structure of the facilities and the profile of the tribal population with respect to their ethnicity, socio-demographics and the number of households. It also included geographical mapping, elicitation of the list of influential key persons in the study area and the information on the implementation of the Tribal Action Plan under the RNTCP.

2. Phase II – Qualitative assessment

It was done through FGDs and interviews with influential representatives within the population, heads of the tribes, older members of the tribe, TB patients, families of TB patients and public health providers. These FGDs and interviews elicited information on the perceptions, suggestions on the treatment and management of TB among the tribal groups.

3. Phase III - Quantitative survey

This was the quantitative survey involving interviews with the head/representative of the household using a structured interview schedule. This was done in 3 parts; Part 1-General Information-census of household members; Part 2-for chest symptomatic; and Part 3- for TB patients. TB disease survey was a part of this assessment.

4. Phase IV – Intervention

After completion of Phase III activities, the data was analysed and based on the findings, suitable interventions such as case referrals, networking with the RNTCP to ensure treatment to diagnosed TB cases, ensuring contact screening and TB prophylaxis for contacts below 6 years, IEC activities etc. were carried out.

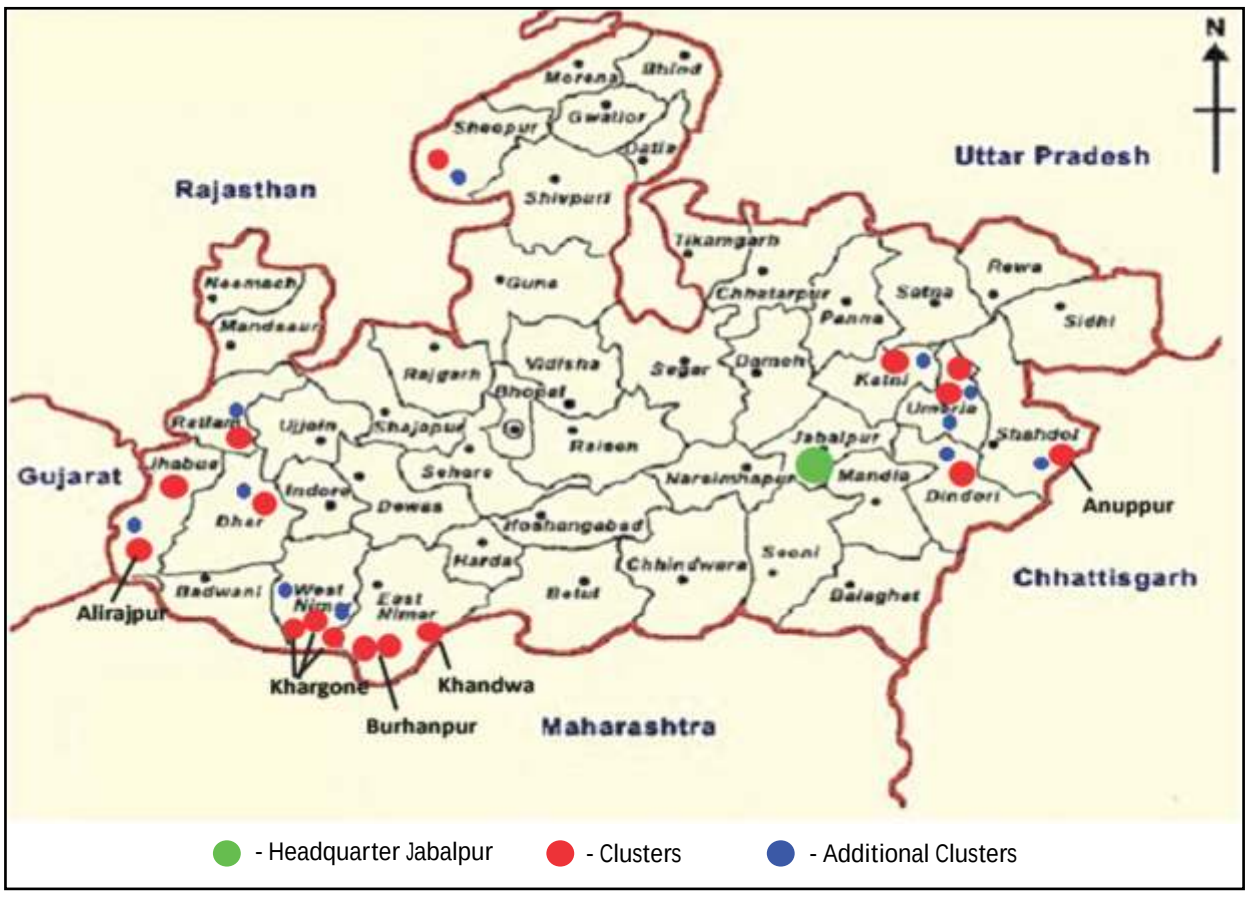
The study was conducted in randomly selected 16 clusters in different districts of the state of MP in various phases. Situational analysis along with the mapping was completed in all the selected clusters. 31 Focus Group Discussions (FGDs) and interviews of 124 key informants (Medical Officer, ANM, ASHA, STS/STLS, Sarpanch, and Patient) were conducted. TB disease survey was also completed in all the clusters.

It was found that malaria was the common health problem reported during FGDs conducted among males. However, among females, the commonly mentioned health problems

were fever, cold, malaria, cough, diarrhoea, Jaundice and stomach pain. Government hospital was mentioned as the preferred health facility followed by traditional healers and private hospitals/doctors for treatment. The common risk factors mentioned for TB were alcohol, smoking and unhygienic habits. Malnutrition was mentioned by few participants. The most common problems mentioned in accessing health facility for diagnosis/treatment were lack of money, distance of health facilities and lack of conveyance.

A total of 72 (65 tribal & 7 non-tribal) sputum positive cases (smear and/or culture) were detected during the study and were referred for treatment under RNTCP. Though it is not appropriate to comment on the prevalence being a subsample of the total sample, the findings suggest that tuberculosis is a major health problem in tribal population of Madhya Pradesh (65/14,396; 451/1,00,000). The cases were five times higher in males compared to females (Table 1.2.1). The Saharia dominated cluster in Sheopur district had highest (22) number of cases in the population screened (882) among all the clusters.

The intervention activities such as case referrals, ensuring treatment to diagnosed cases, contact screening, chemoprophylaxis and IEC activities were carried out in these clusters.



Map of selected study clusters in Madhya Pradesh

Table 1.2.1: Sex wise TB cases in selected clusters

Sex	Population Registered	Population Screened (%)	No. of symptomatic (%)	No. of sputum collected (%)	*Sputum positive individuals
Male	7930	6898(87.0)	430(6.2)	422(98.1)	60(54+6)
Female	8145	7498(92.1)	221(2.9)	218(98.6)	12(11+1)
Total	16075	14396(89.6)	651(4.5)	640(98.3)	72

Though it is not appropriate to draw conclusions based on this sub sample, high number of PTB cases were detected during the study particularly in Saharia dominated cluster in Sheopur district. This clearly indicate high TB burden in tribal population of Madhya Pradesh particularly among Saharia of the state. The findings also highlight problems in accessing health facility for diagnosis/treatment such as lack of money, distance of health facilities and lack of transport facilities in these areas. The intervention activities such as early diagnosis preferably at village level and prompt treatment of TB cases need to be undertaken in tribal areas. Contact screening, chemoprophylaxis and IEC activities are also required to be carried out in these clusters.

The findings indicate high TB burden in tribal population of Madhya Pradesh particularly among Saharia tribe. The findings also highlight problems in accessing health facility for diagnosis/treatment in these areas.

1.3. 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 CHHATTISHGARH

Principal Investigator	:	Beena Thomas, NIRT Chennai
PI at NIRTH	:	Dr. Rajiv Yadav
Status	:	Completed
Funding	:	ICMR (under TSP)

This study was planned to generate community-based primary data on TB prevalence amongst the tribal population in the country and the challenges in accessing health care services and the factors that influence their health care seeking behaviour. This study is a part of the national level multi-centric ICMR task force study on TB under tribal sub-plan. NIRTH, Jabalpur covered the clusters in Chhattisgarh. The primary objectives of the study were - to estimate the prevalence of TB amongst tribal groups (TGs) in various states of the country; to find out the health seeking behaviour patterns of persons having symptoms suggestive of TB and; to develop feasible interventions to improve case finding and compliance for TB treatment through a community based approach. The required sample size for TB prevalence survey was estimated to be about

63,480 adults aged ≥15 years selected from 84 clusters for an assumed prevalence of 387/1,00,000 bacteriologically positive PTB cases with a precision of 15% at 95% confidence level, a design effect of 1.3, and missing or non-response of 10%. Tribal villages with tribal population >70% formed the sampling frame for selection of villages. From the sampling frame, the average cluster size (of adults) was found to be 756. A total of 6 clusters selected in Chhattisgarh were covered in the study.

The study had three phases but considering the distances of clusters from the institute, the remoteness of tribal areas, number of clusters to be covered in these areas and the operational feasibility, it was decided to undertake the activities of all phases (Phase I, II and III) simultaneously in the study area. Situational analysis along with the mapping was done in all the 6 villages (including additional clusters). Twelve Focus Group Discussions (FGDs) were conducted and 57 key informants (Medical officers, ANM, ASHA, STS/STLS, Sarpanch, and Patient) were interviewed.

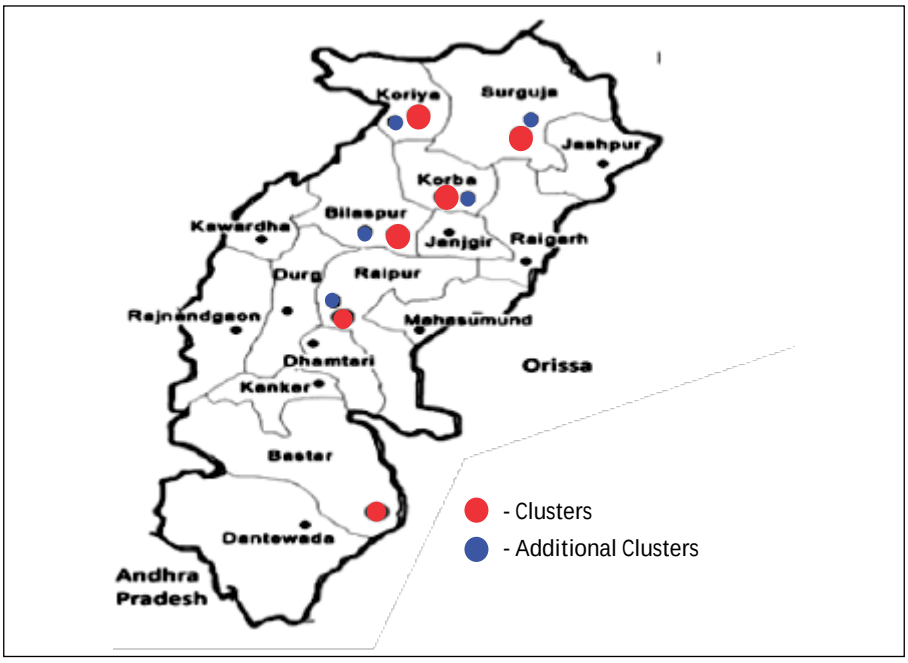
The analysis of FGDs showed that majority of them are aware about TB and the main source of information is friends and relatives. But information related to sources of TB transmission is poor. People visit government health facility for TB diagnosis and treatment; however, many also prefer treatment from traditional healer and private practitioners (*Jhola-chhap,* doctors) and private clinics. Among common risk factors mentioned for TB are alcohol, smoking and unhygienic habits. The most common problems mentioned in accessing health facility for diagnosis/treatment were lack of money, distance of health facilities and lack of conveyance.

The interviews with medical officers and STS/STLS/LT highlighted the local situation with regard to diagnostic & treatment facilities, use of these facilities by the tribal community and the challenges faced by them in implementing the programme activities. It was pointed out that though the facilities for TB diagnosis & treatment are available at health facilities with sufficient drug availability, the patients find difficulty in giving second (OV) sample and also in collecting reports due to long distance from their village in addition to lack of money and transport. INH prophylaxis is almost non-existent in these areas mainly due to non-availability of drugs. With regard to tribal action plan, it was found that no special incentives are given to the patients / staff in these areas.

The TB disease survey was carried out in all six clusters. Of the 6,678 individuals eligible for screening, 5,882 (88%) individuals were screened for symptoms. Of these, 330 (5.6%) individuals were found symptomatic. Sputum was collected from 328 (99.4%) symptomatic individuals who were eligible for sputum collection. A total of 21 (6.4%) sputum positive cases (smear and/or culture) were detected and referred to RNTCP for treatment.

The Phase IV of the study pertains to intervention phase. Intervention activities like case referrals, ensuring treatment to diagnosed cases, contact screening, chemoprophylaxis and IEC activities were carried out in these clusters.

The overall findings suggest that TB is a major health problem in tribal population of Chhattisgarh. The cases were two times higher in males compared to females. The findings also vividly highlighted the problems in accessing health facility for diagnosis/treatment. Contact screening, chemoprophylaxis and IEC activities are also required. The intervention activities such as early diagnosis preferably at village level and prompt treatment of TB cases need to be undertaken in tribal areas.



Map of Chhattisgarh showing selected clusters

The study highlighted the problems in accessing health facility for diagnosis/treatment. Contact screening, chemoprophylaxis and IEC activities are also required to be carried out in these clusters.

1.4. 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. V. G. Rao
Status	:	Ongoing
Funding	:	GFATM through Central TB Division & ICMR, New Delhi

The study commissioned by the Central TB Division have identified two major gaps in service provision to the tribal population *viz* 'access to services' and 'awareness among the community'. Insufficient community engagement, non-involvement of traditional healers, remoteness of the tribal populations from the health services, and lack of appropriate awareness building measures results in delay and incomplete accessing of programmatic services by the tribal population. Hence, this project is undertaken to improve access to TB care services and improve the health seeking behavior of the tribal populations through interventions comprising of structured community engagement, focused involvement of traditional healers and especially targeted usage of Mobile TB Diagnostic Vans (MTDV) equipped with Digital X-ray and sputum microscopy services in remote tribal areas.

The objectives of the study are to strengthen access to RNTCP services in the tribal population; to promote early case detection and treatment adherence in the tribal population and overall improvement in the quality of the services; and to improve awareness on TB and RNTCP services through community based ACSM activities.

The project is being implemented in five states by various ICMR institutes and coordinated by the National JALMA Institute of Leprosy & other Mycobacterial Diseases, Agra. The NIRTH Jabalpur is covering four selected districts in Madhya Pradesh covering a total tribal population of 29.6 lakhs and three in Chhattisgarh covering a total tribal population of 12.9 lakhs (total seven districts). These districts have been selected based on the concentration of tribal population in the district (more than 50% of the total population). The selected districts in Madhya Pradesh are Dindori, Alirajpur, Barwani, Jhabua and three selected districts in Chhattisgarh are Sarguja, Surajpur & Balrampur. It is being implemented in various phases:

Phase I - Baseline

It comprised preparatory activities such as recruitment of staff, training on RNTCP the project staff and procurement of MTDV etc. Further, situational analysis was done to identify the remote locations for visit of MTDV, planning the fixed tour schedule for MTDV and other such aspects. It also comprises of the baseline study during the initial six to eight months.

Phase II- Intervention

Intervention using Mobile TB Diagnostic Vans (MTDV) equipped with Digital X-ray and sputum microscopy services in remote tribal areas for early detection of cases. All the detected cases are being treated by the programme as per RNTCP guidelines.

Phase III- Endline

It comprises of endline survey in the covered tribal population of selected districts.

For this study community volunteers (1/1,000 population) have been identified and trained to create TB awareness and also to identify TB suspected cases in the community. They visit house to house to identify chest symptomatics and make arrangements for their examination at the nearest microscopy centre/MTDV. Also, traditional healers have been involved in the study. Traditional healers are the first point of contact for TB patients among the tribal population. These are line listed and sensitized about RNTCP services and also encouraged to refer TB suspects to RNTCP centres.

Preparatory activities and situational analysis such as mapping, identification of remote villages, formation of village health committees, planning of tour schedule for MTDV etc were completed. The baseline survey including collection of the relevant data is in progress.

Selected districts in Madhya Pradesh

Selected districts in Chhattisgarh

Discussion with health officers

Community meetings

Mobile TB Diagnostic Vans (MTDV) equipped with Digital X-ray and sputum microscopy services launched in remote tribal areas for early detection of cases, which will not only enhance case detection but also improve case management in hard to reach areas.

1.5. INTENSIFIED TUBERCULOSIS CONTROL AMONG SAHARIA TRIBE (PVTG) OF MADHYA PRADESH

Principal Investigator	:	Dr. V. G. Rao
Status	:	Ongoing
Funding	:	Government of Madhya Pradesh

Tuberculosis (TB) has been found to be a major public health problem among Saharia of Madhya Pradesh. The results of the recently conducted study indicate alarmingly high TB prevalence of 3,294 per 1,00,000 in this community. In view of this, the project has been undertaken on the request from Govt. of Madhya Pradesh. The study aims at improving access to TB care services among Saharia in Guna district of Madhya Pradesh through engagement of community volunteers. The high transmission of infection is expected to be interrupted by intensive case detection, prompt treatment and case holding.

The objectives of the study are: promoting early TB case detection by engagement of community volunteers;, and ensuring treatment adherence and improving cure rate by regular monitoring and supervision

The study is being carried out in Saharia dominated villages of Guna district in Madhya Pradesh in collaboration with state & district health authorities and RNTCTP officials. The state TB officers and district TB officers are equal partners in this action plan.

Major activities under the project are - involvement of the community through engagement of TB health volunteers preferably from Saharia tribe; house to house screening to find out TB suspects; treatment of detected cases through DOTS under RNTCP; contact screening; chemoprophylaxis to the paediatric contacts as per RNTCP guidelines; training and regular reorientation of health & RNTCP staff and community based awareness activities.

After budget was released in Oct 2016, the various project posts were advertised followed by recruitment of the staff. The briefings and meetings with the state TB officer and district officials viz, District Collector, CMHO & DTO Guna were held. The study is in progress.

Tuberculosis is a major public health problem among Saharia tribal community of Madhya Pradesh. The study aims at improving access to TB care services among Saharia community in Guna district of the state through engagement of community volunteers. The very high transmission of infection is expected to be interrupted by intensive case detection, prompt treatment and case holding.

1.6. COMPARATIVE STUDY OF LINE PROBE ASSAY AND XPERT MTB/RIF FOR DETECTION OF MDR

Principal Investigator	:	Dr Jyothi Bhat
Status	:	Ongoing
Funding	:	ICMR, New Delhi

The WHO recommends that countries should immediately expand their capacity for culture-based drug-susceptibility testing (DST) and consider new, molecular-based assays for diagnosing drug resistance. The focus of the project is to evaluate commercially available direct susceptibility tests for rapid detection of MDR cases helping in early treatment of the same. RNTCP has already implemented Gene Xpert TB in many places. However, newer evidences suggest that treatment regimens based only on rifampicin resistance are not that effective hence resistance to Isoniazide should also be checked. The strategy also denies patients of INH which is an effective anti TB drug. Hence the present study would compare both the molecular based methodologies viz Gene Xpert and line probe assays (LPA) and also resolve the discrepancies by sequencing them.

The broad objectives of the study are to compare the performance of Xpert MTB/RIF with Genotype® MTBDR plus for detection of rifampicin resistant TB in smear positive and negative retreatment TB cases, and to study the mutation patterns associated with rpoB, katG and inhA genes in this area.

Sputum samples from confirmed cases of Tuberculosis were received from District TB Center, Jabalpur M.P. India. The selection criterion includes smear positives in follow up, retreatment cases, HIV positive cases. The sputum samples were screened for detection of *Mycobacterium tuberculosis* and rifampicin sensitivity by Gene Xpert (Cepheid, Germany) and Line Probe Assay (Hains life sciences) as per manufacturer's protocol. Samples were also decontaminated by Nalc NaOH method and inoculated on solid Lowensten Jensen (LJ) medium for culture. Drug susceptibility testing was done by indirect proportion method. Results of all the methods were compared. Samples with discordant results among methodologies were further processed for sequencing.

This year 396 specimens were tested. Of these 289 were negative by microscopy while 107 were positive. The molecular assays worked well in comparison with smear microscopy.

Both the molecular methods worked well when compared with solid culture and DST (Table 1.6.1). However, few discrepancies were noted.

Discrepancies were also noted among both the molecular methods. The discrepant samples were processed for sequencing. Of the 4 strains, results of sequencing were concordant with that of Gene Xpert in 3 cases while in 1 case it was concordant with that of LPA (Figure 1.6.1). The study is ongoing.

Table 1.6.1: Results of rifampicin resistance across all the methods

LJ	CBNAAT		LPA	
	Rif resistant	Rif sensitive	Rif resistant	Rif sensitive
Rif resistant 4	03	01	03	01
Rif sensitive 41	3*	36	02	37

* 1 not detected and 1 invalid

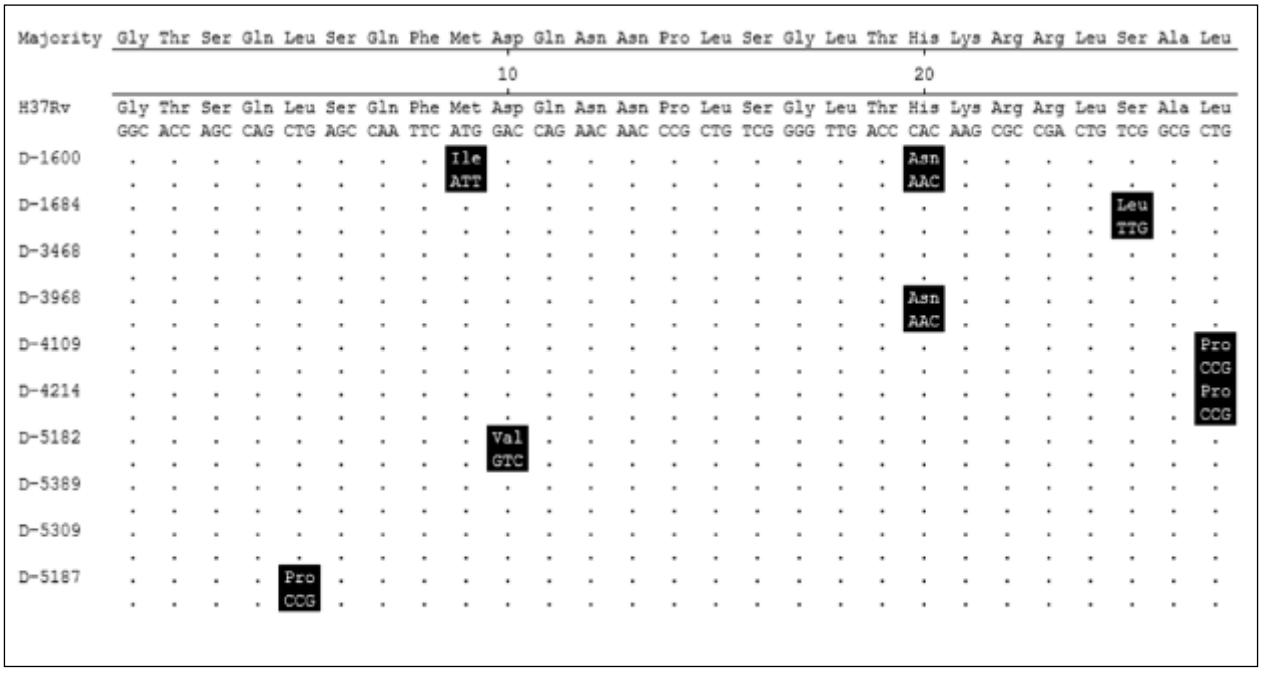


Figure 1.6.1: Sequencing data showing the mutations

Division of Vector Borne Diseases

Division deals with various aspects of vector borne diseases, eg. Malaria, Filaria etc in tribal communities. The laboratories of VBD have well trained & skilled staff and are equipped with modern research equipments/facilities such as DNA Sequencer, FACS, Realtime PCR, parasite culture and maintenance of malaria vector colonies. Currently, the division houses scientists and researchers specialised in Entomology, Biotechnology, Molecular biology, Biochemistry and Bioinformatics. The research areas of division encompasses molecular characterisation of parasite, identification and characterisation of vectors responsible for disease transmission.

Dr Aparup Das is a population geneticist by training. He has brought his extensive training and experience on genomics and DNA sequence analyses, and applied these modern biological techniques to understand malaria epidemiology in India and Africa. At present, Dr. Das is involved in two different major international projects funded by the National Institute of Health (USA) India-Canada Centre for Innovative Multidisciplinary Partnerships to Accelerate Community Transformation and Sustainability (IC-IMPACTS). The long-term goal of Dr Das is to use modern biological tools to unravel epidemiology of malaria and leverage this information in developing novel diagnosis and therapeutics.

Dr. M. M. Shukla is a medical scientist with vast experience on malaria. He has worked on epidemiological and clinical aspects of malaria.

Dr. A. K. Mishra has 32 years of experience on applied field and his lab research work is on malaria epidemiology, vector biology and control especially in tribal forested difficult areas. He is providing support to state malaria control programme.

Dr Gyan Chand is having 35 years of research experience in the field of vector borne diseases particularly malaria, filarial and dengue. He has worked as national expert in independent evaluation of LF elimination program coordinated by VCRC Puducherry.

Dr. Praveen Kumar Bharti's lab has been working on different basic and field oriented clinical aspects of malaria parasite biology. The lab is WHO, Geneva and CDSCO, New Delhi recognised centre for malaria diagnosis and is involved in the evaluation of the quality of malaria rapid diagnostic test (RDTs).

Dr. Anil Verma is interested in investigating various factors associated with asymptomatic malaria and characterisation of immune response in people having asymptomatic malaria in endemic areas. His future plan is to evaluate new, low-cost, point of care malaria diagnostic devices, which can be used in remote tribal areas with limited resources

2. VECTOR BORNE DISEASES

2.1. STATE INTERVENTION MODEL FOR MALARIA CONTROL IN HIGHLY MALARIOUS DISTRICT BALAGHAT IN MADHYA PRADESH BY INTENSIFIED BLOOD SURVEYS AND DRUG ADMINISTRATION

Principal Investigator	:	Dr. Neeru Singh
Status	:	Completed
Funding	:	NRHM, Govt. of Madhya Pradesh

Malaria is an important public health problem in Birsa and Baihar CHCs of the district Balaghat (MP). This area is densely forested and malaria transmission is perennial. Previous studies (2010-1012) revealed a very high slide positivity rate (46.5%) among infants, children and adult during the active surveillances. Different vector controlling measures were applied in the study villages during 2011 to 2014 (like: Zero vector durable lining or ZVDL) but decline in the efficacy of these interventions after a year has limited the sustainability of malaria control efforts in the area. This study aimed to conduct intensified blood surveys using bivalent RDTs for on the spot Drug Administration (ACT or CQ) to control malaria in the region (Early Diagnosis and Prompt Treatment: EDPT) and to assess the impact of EDPT on Infant and Child Parasite rate.

The mass screening was carried out in 102 village (42,293 population covered) of Birsa community health centre (CHC) and 77 village (28,209 population covered) of Baihar CHC by using rapid diagnostic test (RDT). In the first round (base line) of mass screening, a total of 34,966 RDTs were tested followed by 25,530 RDTs in the second and 26,639 RDTs in the third round. Further analysis revealed that the malaria positivity was highest in Songudda PHC and lowest in the Mandai PHC (Figure 2.1.1). The proportion of *P. falciparum* and *P. vivax* was 96% and 4%, respectively. During the 3 rounds of the mass survey, overall reduction of 53% was noted in the malaria positivity.

Age group wise analysis of malaria prevalence revealed that malaria positivity was significantly higher in all the age groups compared to the reference group (Table 2.1.1). Highest malaria positivity was recorded among 1-4 years young children [OR 4.1; 95% CI (3.8 - 4.4); $p<0.0001$] (Figure 2.1.2). All *P. falciparum* positive cases were given ACT (artesunate + SP) and primaquine (PQ), and all *P. vivax* cases were given CQ and PQ as per National Vector Borne Disease Control Programme (NVBDCP) guidelines.

Table 2.1.1: Age-group wise malaria prevalence in first round of mass survey

Age Group (in yrs)	BSE	Malaria Pos	OR Malaria (95% CI)
≤1	2350	15.2	2.5 (2.2 - 2.8)*
>1 - 4	6427	23.0	4.1 (3.8 - 4.4) *
>5 - 8	7934	21.3	3.7 (3.5 - 3.9) *
>9 - 14	10711	16.0	2.6 (2.4 - 2.8*
>14	59713	6.8	Reference
Total	87135	10.7	--

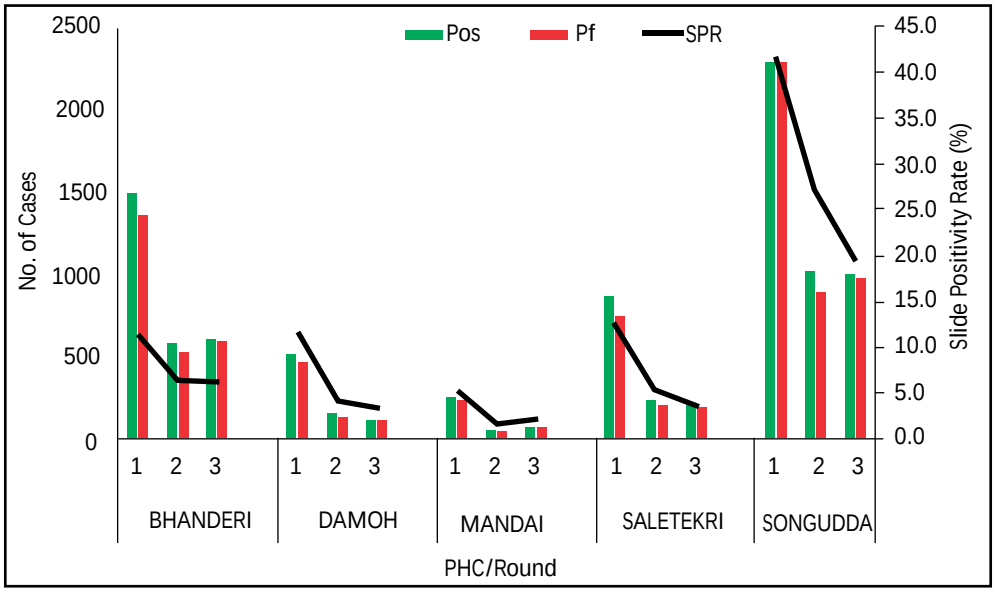


Figure 2.1.1: PHC and round wise mass malaria survey in Balaghat

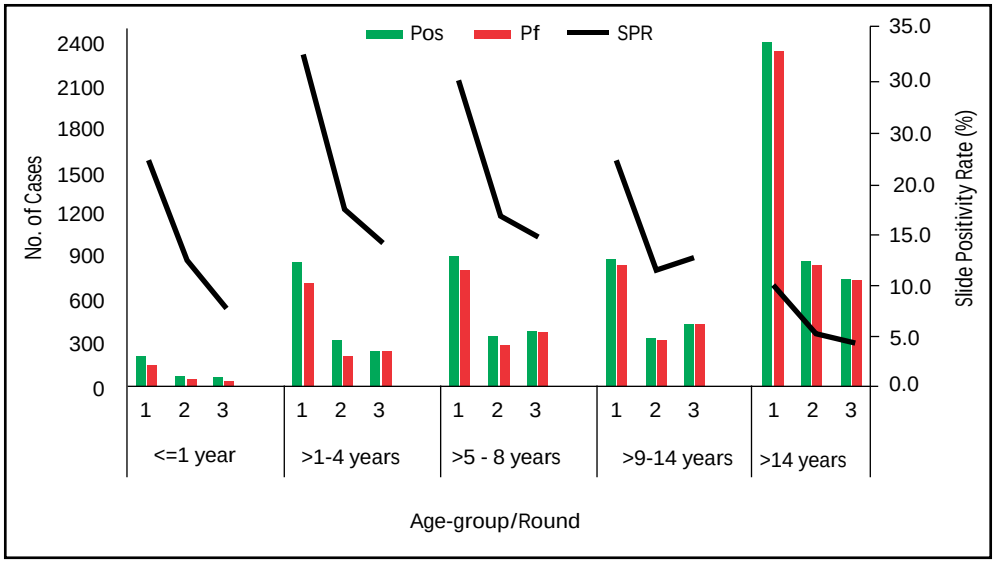


Figure 2.1.2: Age group and round wise mass malaria survey in Balaghat

Processing for Vector incrimination-

Morphologically identified specimens of *An. culicifacies* and *An. fluviatilis*, were taken for the detection of malaria parasite by using diagnostic PCR technique. Genomic DNA of individual mosquitoes was isolated from head– thoracic and abdominal region by phenol–chloroform extraction method and PCR was performed using the oligonucleotide primers targeting 18S rRNA gene. A total of 546 *An. culicifacies* and 52 *An. fluviatilis* were assayed for the presence of sporozoites, of which two *An. culicifacies* were positive for *P. vivax*.

Mass screening and treatment may be an effective tool to control malaria in a densely forested, hard to reach area with high and perennial malaria transmission in the district Balaghat.

The mass screening and treatment of malaria showed a significant reduction in the malaria in the tribal community where malaria prevalence is very high and perennial malaria transmission

2.2. MOLECULAR EPIDEMIOLOGY OF MALARIA IN INDIA AND QATAR WITH AN EMPHASIS ON PARASITE DIVERSITY, DRUG RESISTANCE AND IMMUNE RESPONSE

Principal Investigator	:	Dr. Neeru Singh
Status	:	Completed
Funding	:	Qatar National Research Fund

The genetic diversity in *Plasmodium falciparum* antigens is a major hurdle in developing an effective malaria vaccine. Protective efficacy of the vaccine is dependent on the polymorphic alleles of the vaccine candidate antigens. Therefore, we investigated the genetic diversity of the potential vaccine candidate antigens i.e. *msp-1, msp-2, glurp*, *csp* and *pfs25* from field isolates of *P. falciparum* and determined the natural immune response against the synthetic peptide of these antigens.

This study was carried out at Janakpur Community Health Care (CHC), district Baikunthpur, Chhattisgarh of Central India. Symptomatic patients were screened for the malaria parasites by microscopy using thick and thin blood smears. Genotyping was performed using Sanger sequencing method and size of the alleles, multiplicity of infection (MOI), heterogeneity and recombination rate were analysed.

Asexual stage antigens were highly polymorphic with 55 and 50 unique alleles in *msp-1* and *msp-2* genes, respectively. A total 59 genotypes were found in *glurp* gene with 8 types of amino acid repeats in the conserved part of RII repeat region (Figure 2.2.1). The number of NANP repeats

from 40 to 44 were found among 55% samples in *csp* gene (Figure 2.2.2) while *pfs25* was found almost conserved with only two amino acid substitution sites. MOI for *msp-1* and *msp-2* were 1.67 and 1.28 respectively. The level of genetic diversity in the present study population was very similar to that from Asian countries (Figure 2.2.3). A higher IgG response was found in the B-cell epitopes of *msp-1* and *csp* antigens and higher level of antibodies against *csp* B-cell epitope and glurp antigen were recorded with increasing age groups (Figure 2.2.4). Significantly, higher positive responses were observed in the *csp* antigen among the samples with ≥42 NANP repeats.

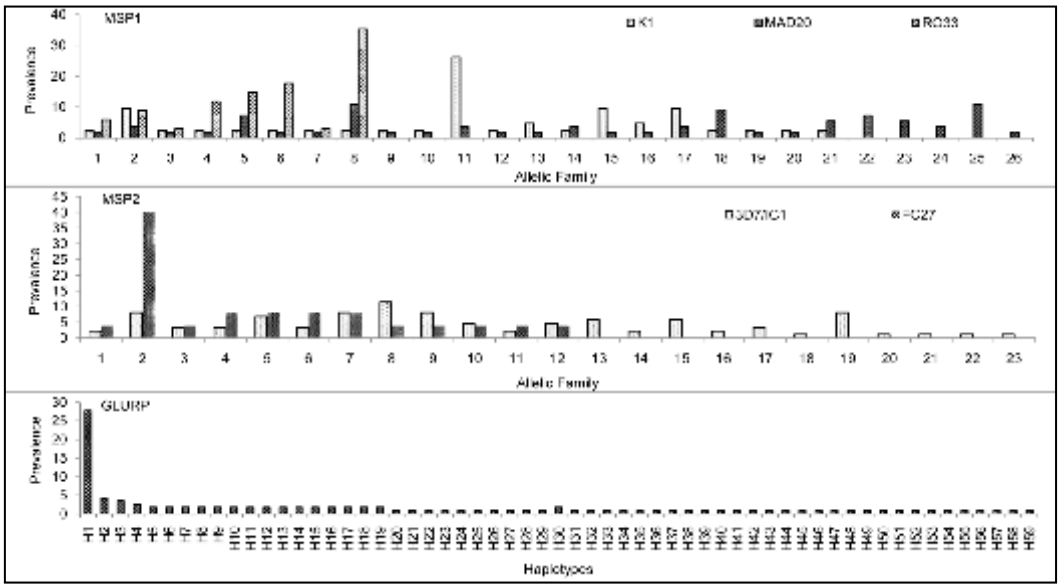


Figure 2.2.1: Frequency distribution of different allelic variations of *P. falciparum msp1, msp2* and *glurp* genes in Indian isolates

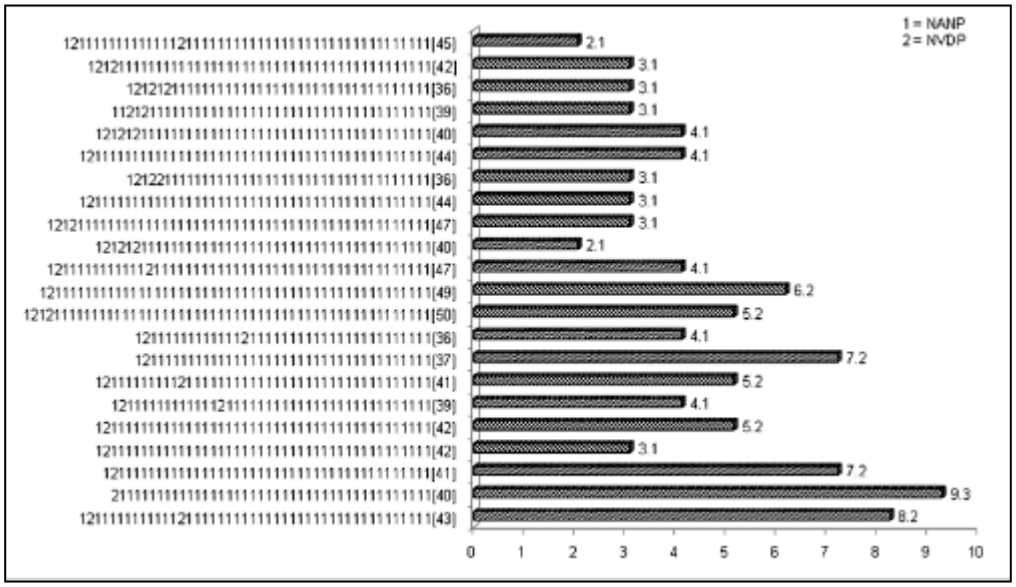


Figure 2.2.2: Prevalence of *P. falciparum* csp haplotypes based on NANP and NVDP repeats and their arrangement

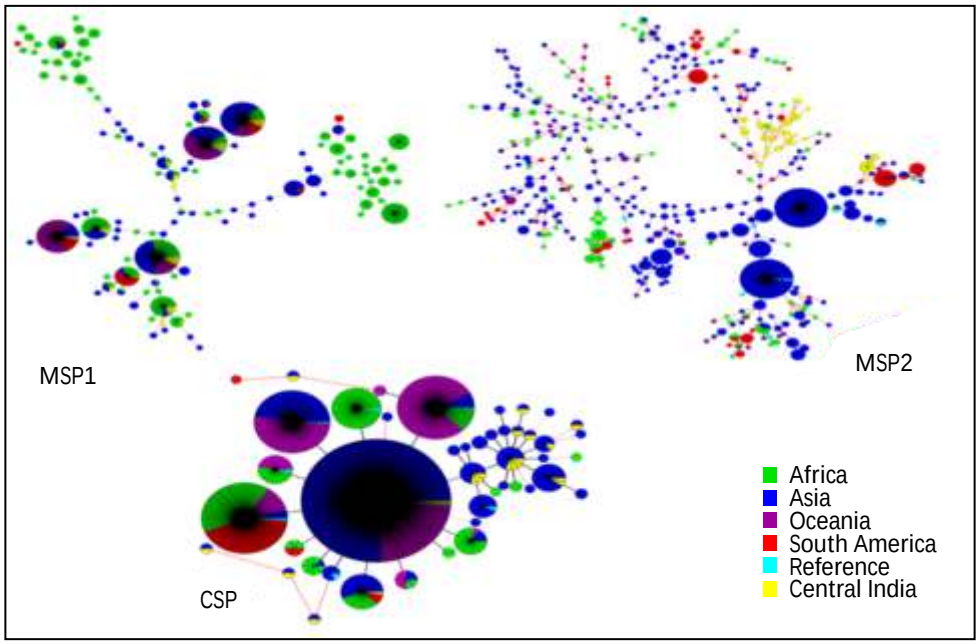
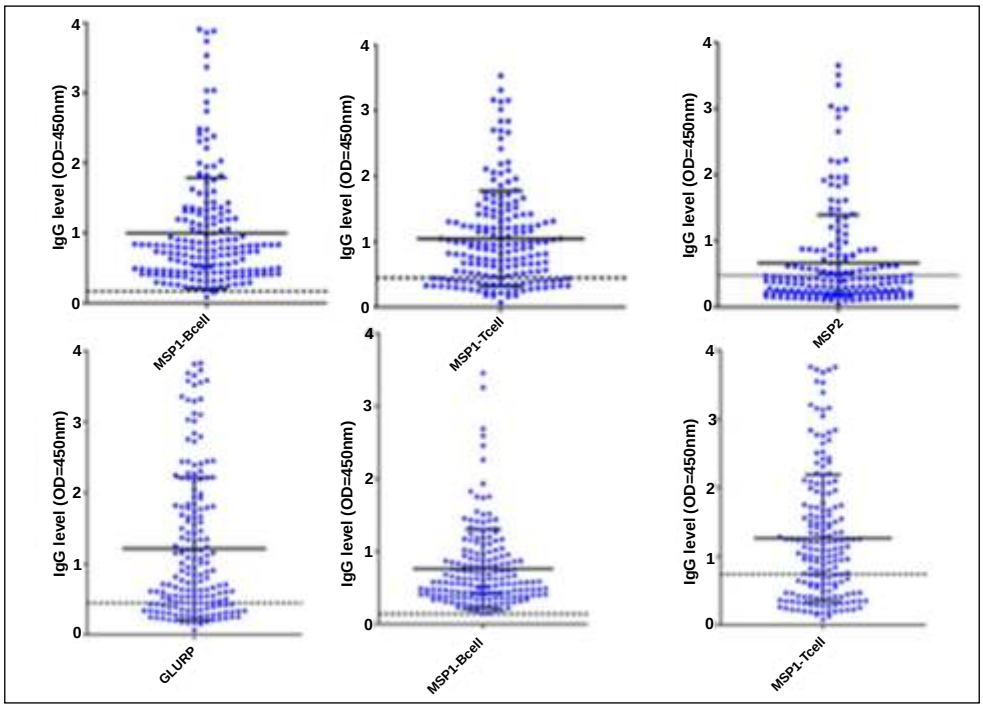


Figure 2.2.3: Global population structure of *P. falciparum* *msp1*, *msp2* and *csp* gene

A minimal spanning tree (MST) generated using BioNumerics software version 7.6.1 shows the relationship from worldwide isolates. Each circle represents an individual haplotype and the size of the circle is proportional to the number of isolates belonging to that haplotypes. The line connecting the circle is branch length.

(A)



(B)

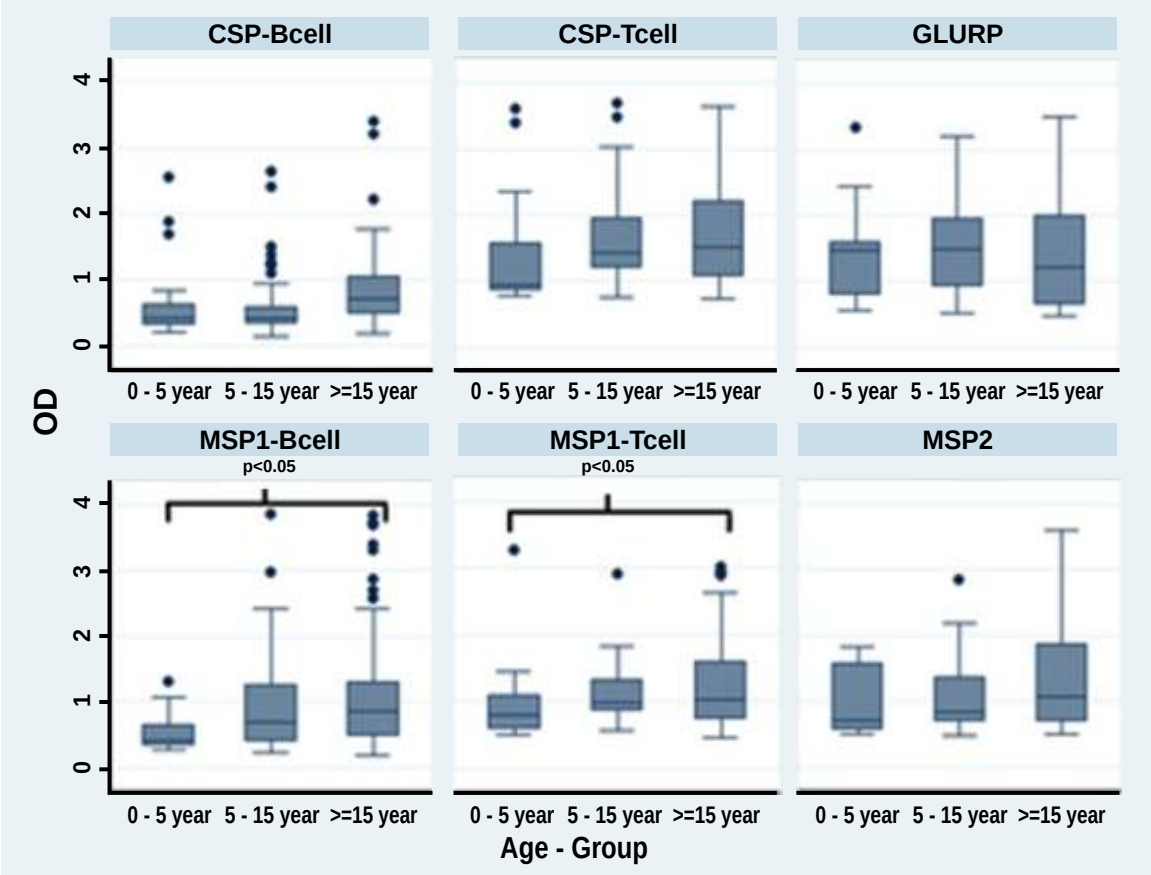


Figure: 2.2.4: (A) Total IgG antibody levels against synthetic peptide of the *P. falciparum* antigens/epitopes; (B) Levels of total IgG antibody responses among different age groups

Box plots depict median values with 25th and 75th percentile values represented by the bottom and top edges boxes. Small* indicate that the antibody responses are statistically significant differences (*p<0.05) when compared among different age groups.

Mutations in six different genes of *P. falciparum* (crt, mdr1, dhfr, dhps, ATPase6 and K-13 propeller) that confer resistance to chloroquine, sulphadoxine-pyrimethamine and artemisinin-based combination therapy were analysed. 78% of the samples were found to have a pfcrt mutation (53% double, 24% triple and 1% single mutant), and 59% of pfmdr1 genes were found to have an N86Y mutation. Double mutations were recorded in pfdhfr gene among 76% of the samples while only 6% of the samples harbored mutant genotypes in pfdhps (Figure 2.2.5). No mutation was found in the K-13 propeller gene, while only one sample showed a mutant genotype for the PfATPase6 gene. The Tajima test (population genetic test to confirm randomly evolving mutations and non-randomly selection) confirmed that there is no role of evolutionary natural selection in drug resistance, and gene pair wise linkage of disequilibrium showed significant intra-genic association (Figure 2.2.6).

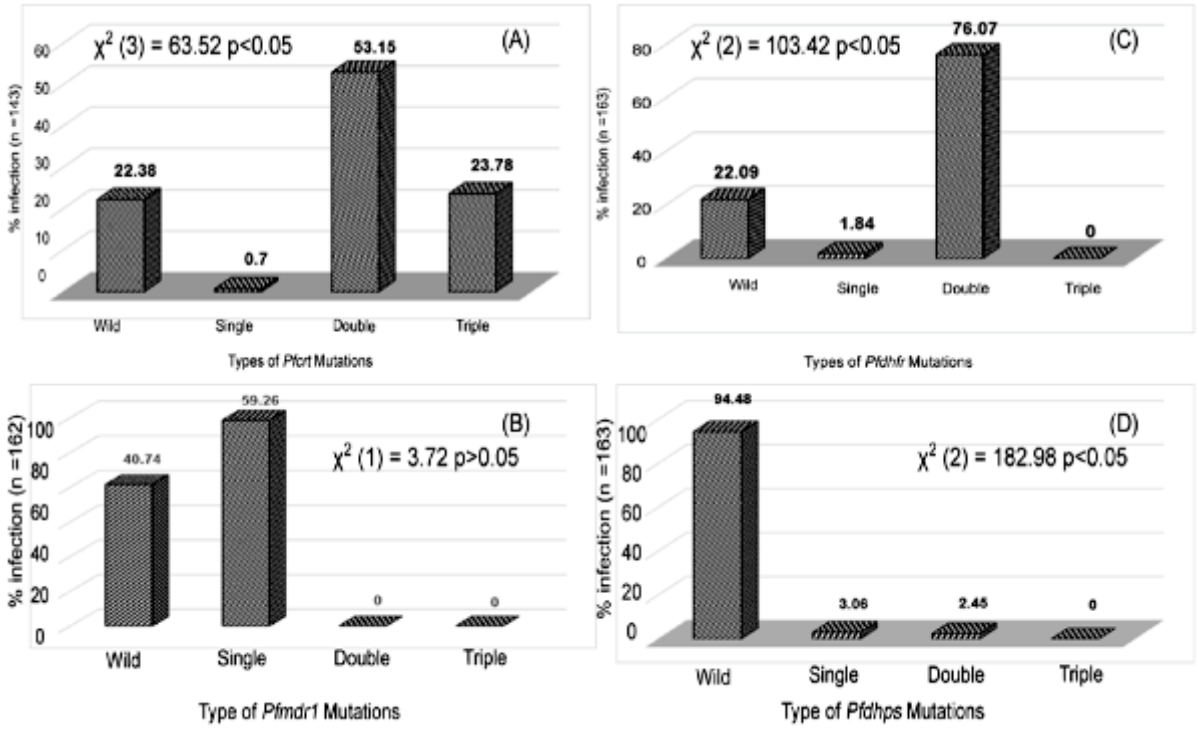


Figure 2.2.5: Mutation rates in *P. falciparum* genes (*Pfcrt, Pfdhfr, Pfdhps* and *Pfmdr1*) that confer resistance to antimalarials

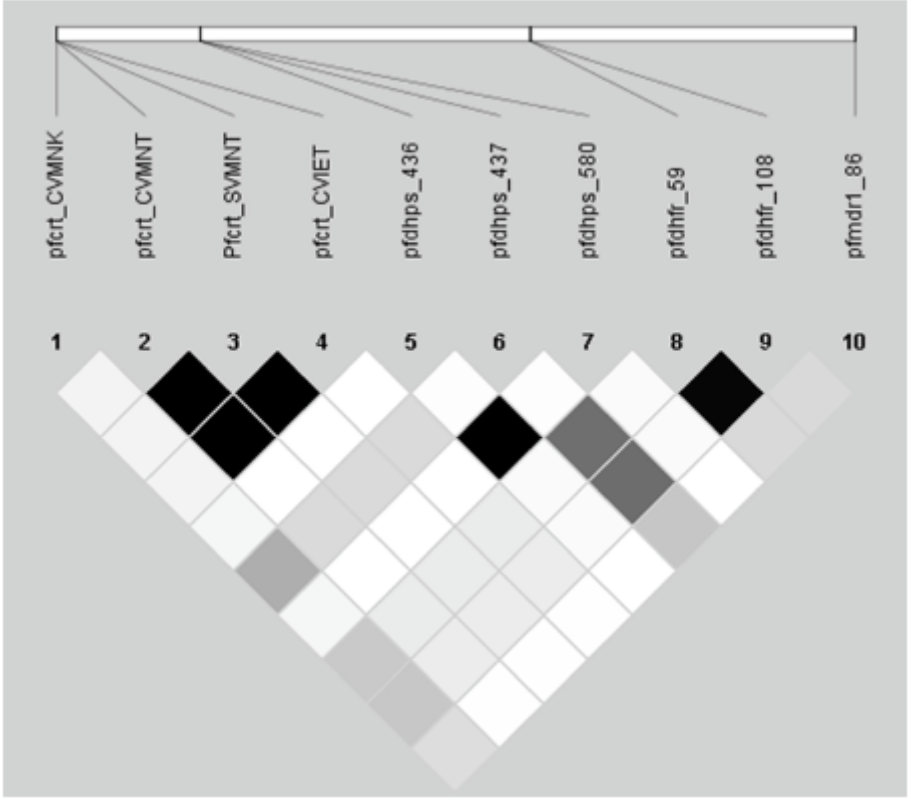


Figure 2.2.6: Linkage disequilibrium (LD) between pairs of SNPs located in four different genes (*Pfcrt, Pfdhfr, Pfdhps* and *Pfmdr1*) implicated in drug resistance in *P. falciparum* populations

This extensive study contributed in understanding the type and distribution of naturally evolved genetic polymorphism in the *P. falciparum* vaccine candidate antigens from Chhattisgarh, Central India, where malaria is endemic. The present findings showed extensive genetic diversity in the asexual stage antigens. Antibody titre was higher for B cell epitopes of the tested asexual antigens and showed age dependent increase. Drug resistance genotyping showed widespread prevalence of mutants in *pfcrt*, *pfmdr-1* and *pfdhfr* genes. There is probably some association between malaria hyper endemicity and the parasite mixture as well as the number of alleles present in the area. This data would be helpful in the future malaria vaccine trial in India and to monitor changes in the parasite population.

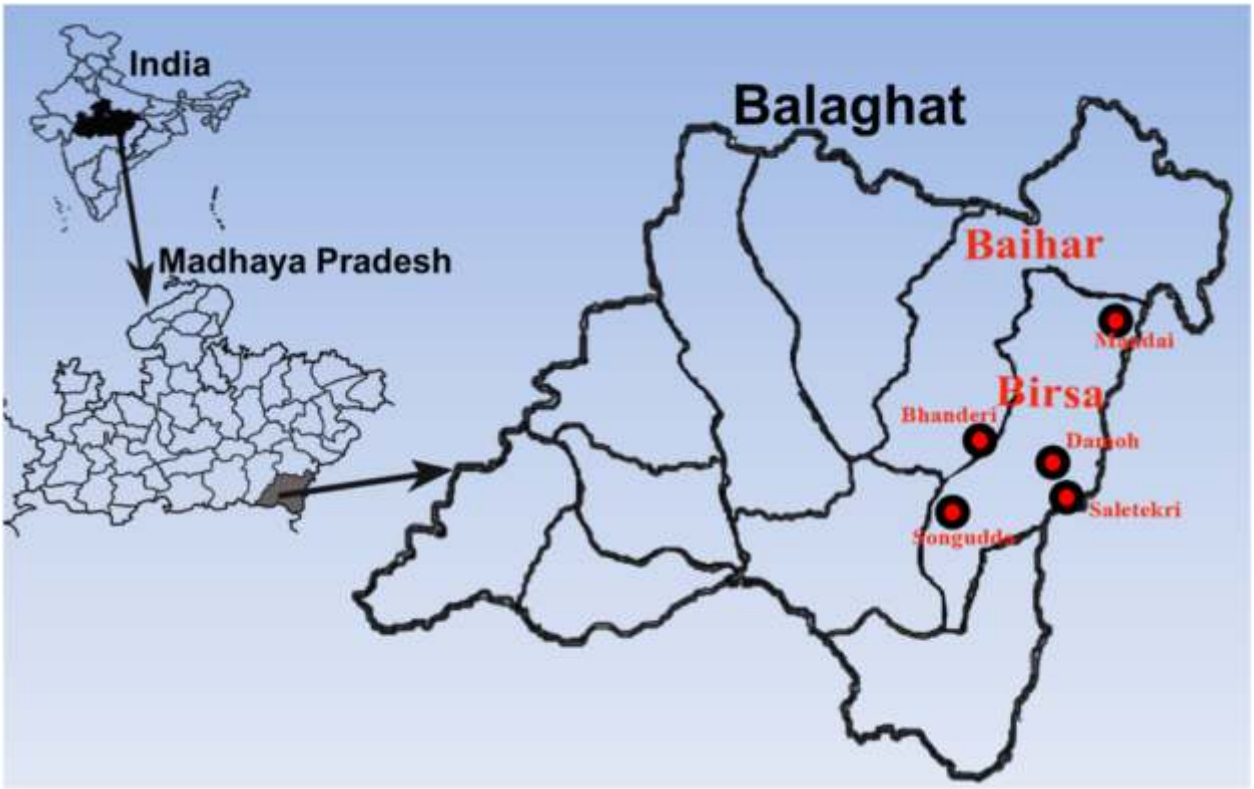
The presence of genetic diversity in this population and antibody response for more than one antigen suggests that a successful malaria vaccine should contain multiple antigens. The high level of *pfcrt* mutations suggests that parasite is resistant to chloroquine, resistance to SP is evolving in the population, and parasites remain sensitive to artemisinin derivatives.

2.3. A FIELD BASED STUDY TO ASSESS THE BURDEN OF MALARIA IN PREGNANCY (MIP) IN TWO BLOCKS (BIRSA AND BAIHAR) OF DISTRICT BALAGHAT, MADHYA PRADESH, CENTRAL INDIA

Principal Investigator	:	Dr. Vidhan Jain
Status	:	Completed
Funding	:	NRHM, Govt. of India

Pregnant women (PW) are more susceptible to malaria and severe malaria infection compared to non pregnant women. It is adversely associated with anaemia, severe malaria/death in mothers and lower birth weight, abortion and still birth of fetus. Each year around 125 million pregnancies (62% from WHO-SEARO & 24% from WHO-AFRO region) are at risk of malaria worldwide. *P. falciparum* (*Pf*) (sequestered to placenta by *Pf*EMP-1-CSA binding) contributes to majority of the malaria burden in WHO-AFRO/SEARO region, where as significantly important proportion is shared by *P. vivax* in WHO-SEARO region. Reported malaria prevalence in different states of India ranged 1.3–17% among pregnant women by peripheral blood smear examination and 1.4–29.1% by the placental blood smear examination (BSE). Placental histopathological studies revealed higher malaria prevalence compared to other methods including PCR. Although most of the studies in India were done in a hospital based settings and only little is known about field based burden of the problem. This study was done with the broad objective to assess the gravida wise burden of malaria (symptomatic and asymptomatic) and associated adverse outcomes during pregnancy in a meso-endemic area of Central India.

This field study has been carried out in two blocks (Baihar and Birsa) of the district Balaghat, MP from the period of August 2014 to June 2017. Seventy percent population of the area is tribal including primitive vulnerable "Baiga tribe". Women were approached with the help of Aaganwadi/ASHA worker. Verbal consent has been taken at the time of enrolment, prior to the peripheral finger prick blood screening for malaria (JSB stain & Bivalent RDTs). 20 µl filter paper blood sample was obtained from PW and haemoglobin estimation was done using cyanmethemoglobin method. A brief questionnaire revealing socioeconomic status of the women has also been filled. If found malaria positive, women were treated following NVBDCP guidelines according to the malaria spp. Birth outcomes of enrolled PW were recorded from Aaganwadi register. Statistical software 11.0 was used in calculating frequency distribution and calculating p values.



Studied PHCs & sites shown in two blocks (Birsa and Baihar) of distinct Balaghat

As part of the study a total of 1,664 pregnant women were screened for malaria (581 primigravids, 564 secundigravids and 519 multigravids) using RDTs and microscopy. Malaria prevalence at the time of enrolment was found to be 23% (26.5% among primigravida, 19.7% in secundigravids and 22.4% in multigravids; 22.8% in 2014-15, 21.8% in 2015-16 and 23.9% in 2016-17). Species distribution revealed 87.4% *P. falciparum* infections *(Pf),* 8.9% *P. vivax* infections *(Pv)*, 0.29% *P. malariae* infections *(Pm)* and 0.53% were mixed infections(*Pf* + *Pv*). Most of the infections were asymptomatic (81.6%). *Pf* malaria prevalence was significantly higher among primigravids compared to secundigravids and multigravids ([OR 95%CI, 1.6 (1.2-2.2), p = 0.0029] and

multigravids [OR 95%CI, 1.4 (1.0-1.9) p = 0.017]. Malaria prevalence among Baiga PW (42.1%) was significantly higher compared to Gonds (22.9%) and non tribals PW (8.2%) [OR, 2.4 (1.7-3.4), p< 0.00001; OR 8.1 (3.8-19.2), p< 0.00001]. Prevalence of anaemia and severe anaemia (Hb<7 g/dl) among pregnant women was 79.7% and 19.4% respectively. Malaria prevalence at ANC follow-ups (N = 403) was 21.6% (*Pf* = 93%) and malaria prevalence at PNC follow-up (N = 778) was 13.5% (*Pf* = 90%). Primigravida had higher *Pf* parasitemia 360 (80-1,034.8) compared to secundigravida 270.9 (80-560) and multigravida 227 (77.7-480.7). Only 18.5% women attended middle school and above. Lower malaria prevalence was recorded among women belonging to the families with sufficient food security for the whole year compared to who did not [OR, 0.6 (0.4-0.8), p = 0.0007). Birth outcomes of 300 enrolled and malaria exposed PW were recorded from Aaganwadi register (birth weights were available for 211 deliveries), prevalence of lower birth weight, still birth and abortion was 18.5%, 5% and 3% respectively. Further 1.3% newborns died very shortly after birth. Only 42.7% deliveries occurred at health centres. Infant parasite rate was 9.6% (N = 356).

We need to ensure trained ASHA workers in every village with provision of RDTs/ACTs for malaria testing and treatment at village level. Sufficient stocks of RDTs/ACTs should be maintained at Aaganwadis. PW should be given LLINs (long lasting insecticide bed nets) and encouraged for the institutional delivery.

Overall malaria prevalence was 23 percent with significantly higher Pf prevalence in primigravids. Prevalence of lower birth weight, abortion and still birth was 19%, 5% and 3% respectively.

2.4. BIONOMICS OF MALARIA VECTORS AND THEIR SIBLING SPECIES TO ESTABLISH THEIR ROLE IN MALARIA TRANSMISSION IN CHHATTISGARH, INDIA

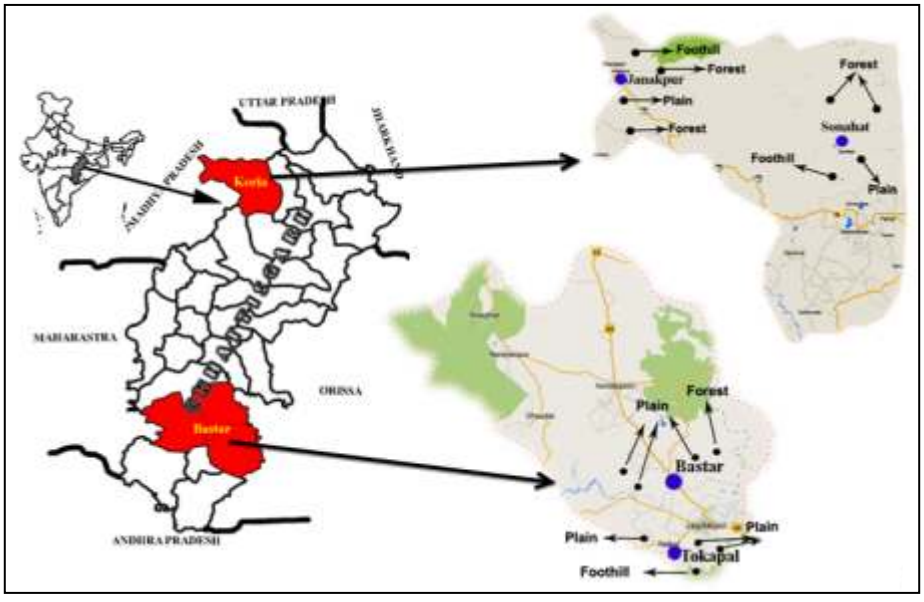
Principal Investigator	:	Dr. Praveen Kumar Bharti
Status	:	Completed
Funding	:	ICMR, New Delhi

India contributes greatly to the global incidence of malaria. The presence of various malaria parasite and vector species, climatic diversity affecting growth and proliferation of the parasite and vector as well as a highly susceptible human population have resulted in high malaria transmission in some parts of India. Six major vector species i.e. *Anopheles culicifacies*, *An. fluviatilis, An. minimus, An. dirus, An. sundaicus and An. stephensi* belonging to *Anopheline* genera spread malaria. *An. culicifacies* and *An. fluviatilis* are reported to transmit the disease in rural and tribal areas of Chhattisgarh. Both these vector species are complexes of sibling species. Of these two, *An. culicifacies* alone is responsible for the transmission of 60-70% of the reported malaria cases. The

overall objective of the project was to study the bionomics of prevalent malaria vectors and their role in malaria transmission in highly malarious districts for the development of evidence based sustainable malaria control strategy with special reference to vector control.

The study was conducted in highly malarious districts Bastar and Korea of Chhattisgarh state. Chhattisgarh state is endemic for malaria. Bastar district is situated in the southern part of Chhattisgarh state while Korea is in the north-western part. Both of the districts have dense forest cover, which is about 53.7% of the total area.

Entomological surveys were carried out every month that included indoor and outdoor resting collections, pyrethrum spray sheet and larval collections. Blood fed *Anophelines* were sampled for studying host preference. Insecticide susceptibility tests were carried out to investigate the susceptibility status of malaria vector to various insecticides in use. Vector incrimination was done using PCR assay to detect malaria parasite infection in mosquitoes. Sibling species of the vectors were identified with the help of PCR and DNA sequencing methods.



Map showing study sites in Chhattisgarh state

A total of 17 different *Anopheles* species were collected, out of which *An. culicifacies* was the predominant one. *An. culicifacies* was prevalent throughout the year showing seasonal peaks. This species was incriminated as the vector of malaria parasite in the study. Sibling species complex of *An. culicifacies* in the region mainly constituted of species C while in *An. fluviatilis* complex, species T was the most abundant one (Figure 2.4.1 & 2.4.2). Blood meal analysis of both *An. culicifacies* and *An. fluviatilis* revealed that they are primarily zoophilic. Breeding takes place mainly in stream, rocky pits and seepage water. Insecticide susceptibility tests showed that *An. culicifacies* is highly resistant to DDT and Malathion, showing variable resistance to Pyrethroids (Table 2.4.1).

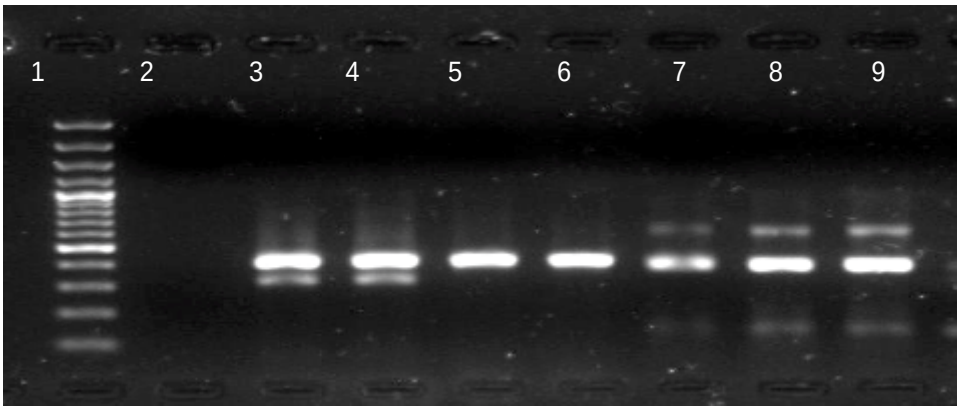


Figure 2.4.1: Gel picture showing DNA bands of D3 region for sibling species of *An. fluviatilis* (Lane 1: 100 bp DNA ladder, Lane 2: Negative control, Lane 3-4: sp S; lane 5-6: unidentified; lane 7-9: sp T)

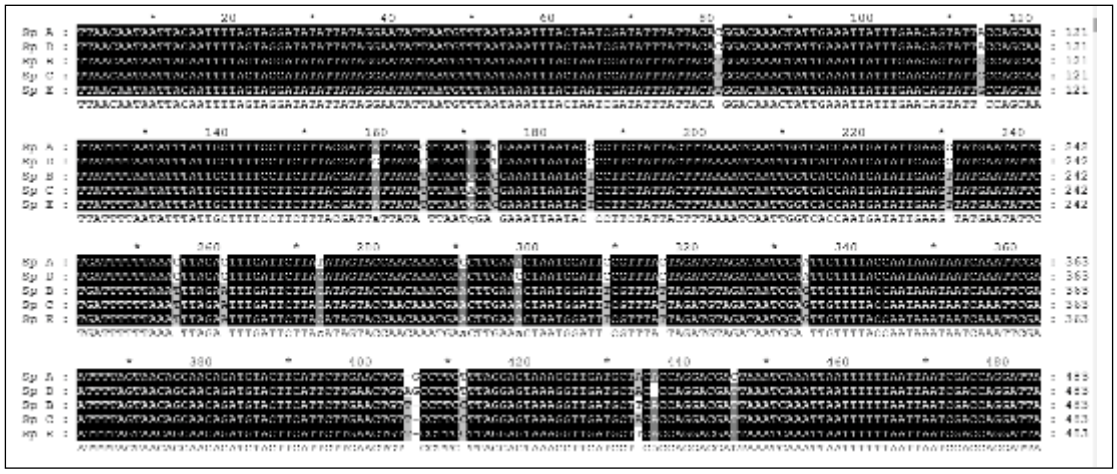


Figure 2.4.2 Nucleotide alignment of mitochondrial subunit COII gene sequence of *Anopheles culicifacies* sibling species complex

A total of 6124 mosquitoes were tested for the presence of malaria parasite. Five *An. culicifacies* mosquitoes, two of *P. falciparum* strain and three of *P. vivax* strain, were found positive, (Figure.2.4.3-2.4.4).

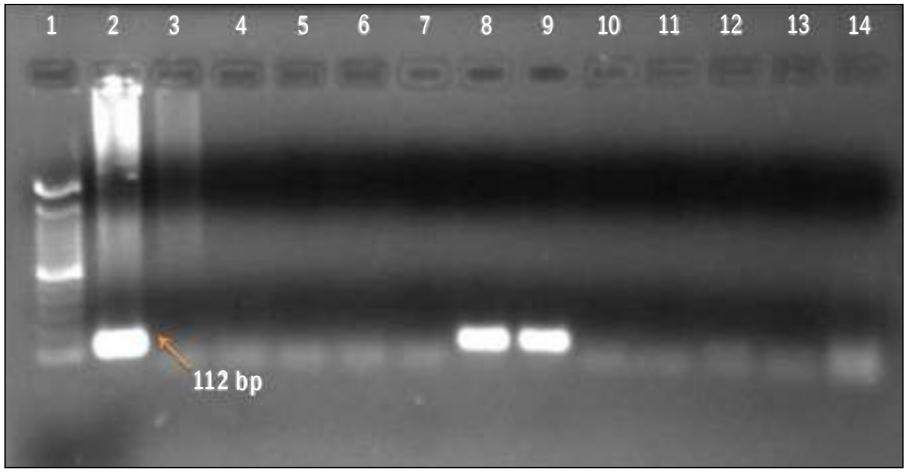


Figure: 2.4.3: Gel picture showing the PCR amplification of *P. vivax* 18s rRNA gene (112 bp) (Lane 1: 100bp DNA ladder, Lane 2: positive control, Lane 3: negative control, Lane 4-14: DNA sample of mosquito, Lane 8 and 9 showing the positive for *P. vivax*)

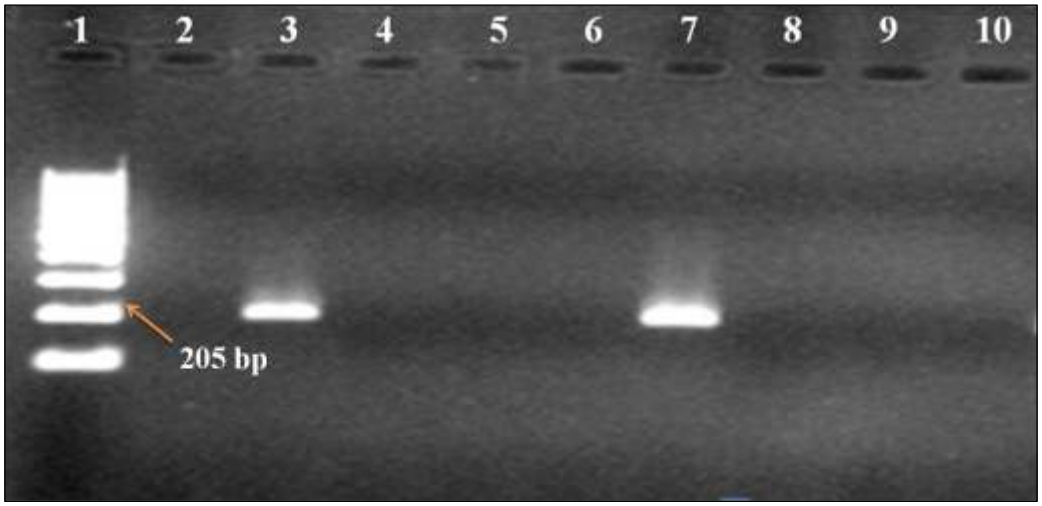


Figure: 2.4.4: Gel picture showing the PCR amplification of *P. falciparum* 18s rRNA gene (205 bp) (Lane 1: 100bp DNA ladder, Lane 2: Negative control, Lane 3: Positive control, Lane 4-10: DNA sample of mosquito, Lane 7 showing the positive for *P. falciparum*)

Table 2.4.1: Insecticide susceptibility status of *An. culicifacies* in Bastar

Insecticides	No. of mosquito tested	Corrected Mortality (%)
Alphacypermethrin 0.1%	240	100
Deltamethrin 0.05%	240	97.4
Malathion 5%	240	65.8
DDT 4%	240	15

The present study provided substantial information about abundance, distribution, breeding, host preference, insecticide susceptibility status, sibling species composition and parasite prevalence in vector species. *An. culicifacies* was incriminated as the vector of malaria in this region. The species is the most abundant of all *Anopheline* species and is present throughout the year, the reason contributing to the year round malaria transmission in the study sites. The blood meal analysis studies revealed that both *An. culicifacies* and *An. fluviatilis* are mainly zoophilic. The behaviour might be due to the fact that in the study villages, cattles are kept near or inside the houses. Further, *An. culicifacies* was found to be resistant against DDT and Malathion and showed indications of emergence of resistance against pyrethroids.

An. culicifacies is predominant and prevalent throughout the year showing seasonal peaks. Sibling species complex of *An. culicifacies* in the region mainly constituted of species C while in *An. fluviatilis* complex, species T was the most abundant. *An. culicifacies* is highly resistant to DDT and Malathion, showing variable resistance to Pyrethroids.

2.5. PREPARATORY STUDY FOR THE CONTROL OF MALARIA IN THE DISTRICT GADCHIROLI MAHARASHTRA

Principal Investigator	:	Dr. Gyan Chand
Status	:	Completed
Funding	:	Intramural

Gadchiroli is a tribal dominated district of Maharashtra state located in the eastern part bordering the state of Chhattisgarh and Andhra Pradesh. 39% population of the district is tribal and Gond is the predominant tribe. This is a highly malarious district in the state. In 2015, this district reported 60% of total malaria cases and 87% of total *P. falciparum* cases in the states while its population is only 0.95% of the state's population. The area was under alpha cypermethrin and cyfluthrin spray for the last 6 years from 2008 to 2014. From 2015, Lambda Cyhalothrin is being sprayed. Long lasting insecticide impregnated nets were also distributed in the villages. Early diagnosis and prompt treatment policy is strengthened by introducing RDT and ACT which is further strengthened by employing additional man power in the form of workers along with regular ANM, MPW and ASHA workers for better execution of anti-parasitic activities. Further to curb malaria, villages were grouped in three categories on the basis of the API of last two years. In Group A villages having API ≥50, ACT was given by state workers to all the fever cases and blood slide was prepared. In Group B having API between 5 - <50 and & Group C (having API < 5), treatment was provided as per the RDT results following NVBDCP guidelines.

The study was carried out with the objectives to study the population dynamics of malaria vectors and to evaluate susceptibility status of *An. culicifacies* against commonly used insecticides in public health.

The study was carried out in four blocks i.e., Dhanora, Etapalli Kurkheda and Gadchiroli. Six villages of these blocks were further selected representing various geographical terrain and feasibility. To determine vector and anopheline composition, the mosquitoes were collected by standard hand catch method using torch and mouth aspirator in the morning hours between 6.00 am to 9.00 am, Space spray method from human dwellings and evening collections between 6.00 pm to 9.00 pm by using light trap. Susceptibility status of *An. culicifacies* was evaluated using WHO standard test kit against commonly used insecticides in the field camp.

Eight anopheline species were found in all the three modes of collections. *An. subpictus* and *An. culicifacies* were the predominant species in the resting collection while in evening collections *An. subpictus* was found as the predominant species. *An. fluviatilis* was found only in November month from only one village located on top of the hill amidst in forest. Proportion of *An. culicifacies* in the evening collection was very less in comparison to resting collection (Table 2.5.1). Overall man hour density of *An. culicifacies* and *An. fluviatilis* was 20.6 and 0.1 respectively.

Table 2.5.1: Anopheline density in the study area

Species	Man Hour Density	Proportion in morning Collection	Proportion in total catch	Proportion in evening collection
An. culicifacies	20.6	33.2	20.3	4.0
An. subpictus	38.6	62.3	72.9	83.7
An.vagus	0.9	1.5	5.1	2.1
An. annularis	1.5	2.5	1.7	6.0
An. fluviatilis	0.1	0.2	0	0.2
Others	0.2	0.3	0	4.0

Regarding susceptibility status of *An. culicifacies*, the corrected mortality was 37.1% (95%CI: 27.5 - 47.2) for DDT (4%), 59.9% (95%CI 49.7 - 69.7) for Lambda Cyhalothrin (0.05%), 70.2% (95%CI: 60.0 - 78.7) for Cyfluthrin (0.15%), 74% (95%CI: 64.3 - 82.2) for Malathion (5%), 83.8 % (95%CI: 75.3 - 90.6) for Deltametherin (0.05%) and 91.3% (95%CI: 83.6 - 95.8) for Permethrin (0.75%).

Showing Insecticide susceptibility test at study site

An. culicifacies mosquitoes found in Gadchiroli are multi-drug resistant having resistance to three major groups of pesticides i.e. organochlorine (DDT 4%), organphosphorous (Malathion 5%) and pyrethroids (Cyfluthrin 0.15% and Lambda cyhalothrin 0.05%). There is possible resistance in Permethrin 0.75% which needs to be confirmed from the repeat test.

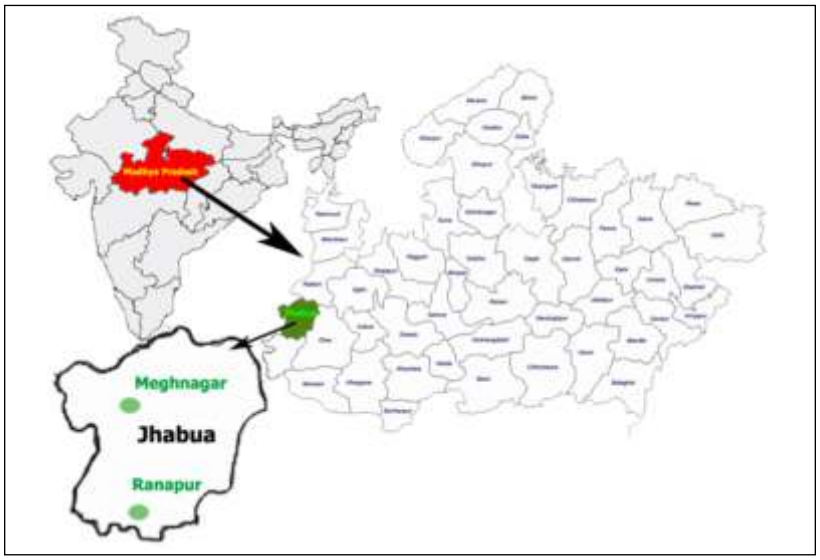
The multiple insecticide resistance in *An. culicifacies* highlights the challenge in malaria elimination program by 2030. There is a need for looking alternate insecticide for use in indoor residual spray and use in long lasting insecticide treated nets to achieve the goal of malaria elimination.

2.6. AN ASSESSMENT OF INTERVENTION MEASURES FOR PREVENTION OF MALARIA IN PREGNANCY: A PROSPECTIVE LONGITUDINAL STUDY IN CENTRAL INDIA

Principal Investigator	:	Dr. Neeru Singh
Status	:	Ongoing
Funding	:	ICMR, New Delhi

An estimated 125 million pregnant women worldwide are exposed to the risks of malaria in pregnancy (MiP) every year, contributing to morbidity and mortality in pregnant women and newborn babies. In the Asia-Pacific region most of the pregnant women are at risk of infection with both *Plasmodium falciparum* and *P. vivax*. When women have little immunity, each infection is potentially fatal to the mother, fetus, or both. Current recommendations for the control of malaria in pregnancy are largely based on the situation in Africa, but strategies in the Asia-Pacific region are complicated by heterogeneous transmission settings, drug resistance and multiple vector transmission.

The present study is being conducted in Jhabua district of Madhya Pradesh to determine the efficacy of intermittent preventive screening and treatment (IST) strategy on malaria in pregnancy and associated outcomes. Community Health Centre (CHC) Meghnagar, of district Jhabua, Madhya Pradesh was selected for Symptomatic group (SMT) and Ranapur; CHC was selected for screening all pregnant women who visit CHC hospital for routine check-up.



Map showing Study Site, Jhabua District, Madhya Pradesh

Enrolled pregnant women were interviewed by trained study personnel who collected information on socio-demographic characteristics (i.e., date of birth, socioeconomic status, literacy), gravidity, history of fever and anti-malarial drug use, and use of anti-malarial prevention

measures. Gestational age was determined from the height of fundus as per gynecologist estimation as well as from Last menstrual period (LMP) (if known). Axillary temperature was measured. RDT and blood smear was performed for malaria parasite detection. Hemoglobin (Hb) was also estimated. All positive malaria cases were given treatment according to NVBDCP guidelines.

Study procedures at CHC of Ranapur, Jhabua

Study procedures at CHC of Meghnagar, Jhabua

Capillary blood was collected by finger-prick soon after the delivery for Hb estimation and for preparation of blood smears for examination of malaria parasites. Placentas were processed and thick and thin smears of the placenta and cord blood were prepared for further examination of malaria parasites. Weight of the baby at the time of birth was recorded.

Placenta processing after delivery and preparation for blood smear & RDT

Diagnosis of malaria was done by Bivalent RDTs (SD Bioline Malaria Antigen *Pf/Pv*) for the identification of *P. falciparum* and *P. vivax*. Blood smear examination was also done by finger-prick method from pregnant women at ANC visits and soon after delivery at DUs for determination of maternal peripheral blood parasite density.

Thick and thin smear of the maternal side of the placenta and cord blood smear was also prepared by wiping away excess blood and incising the placental/cord surface. Thick and thin smears were Giemsa-stained and were examined under light microscope. Blood obtained from the mother was used to measure Hb level at the time of ANC visit and immediately after delivery. Hb estimation was done using calorimetric method.

In Ranapur CHC, selected as IST group, a total of 689 pregnant women were enrolled in the study during the study period from April-2016 to March-2017. Out of 689, 2.5% (17/689) of pregnant women were positive for malaria, of which 65% (11/17) were positive for *P. falciparum*, 23% (4/17) with *P. vivax* and 12% (2/17) were having mix infection with both the species (*P. falciparum* and *P. vivax*) (Figure 2.6.1). All the enrolled pregnant women were followed up every next month of enrollment during their antenatal care visits. A total of 978 follow up were done during the routine ANC visit, out of which 1.6% (16/978) of women were positive for malaria. Hb

profiling was done during the enrollment and subsequently at follow up. At the time of enrollment 27% women (185/689) were mildly anaemic, 64.3% (443/689) pregnant women were moderately anaemic and only 1.5% (11/689) were severely anaemic. A total of 575 deliveries were recorded, out of which only 75% (429/575) deliveries could be attended in the hospital and rest 25% (146/575) were missed. At the time of delivery eleven women (2.6%) were found positive for malaria, out of which 73% (8/11) were positive for *P. falciparum*, 27% (3/11) were infected with *P. vivax.*

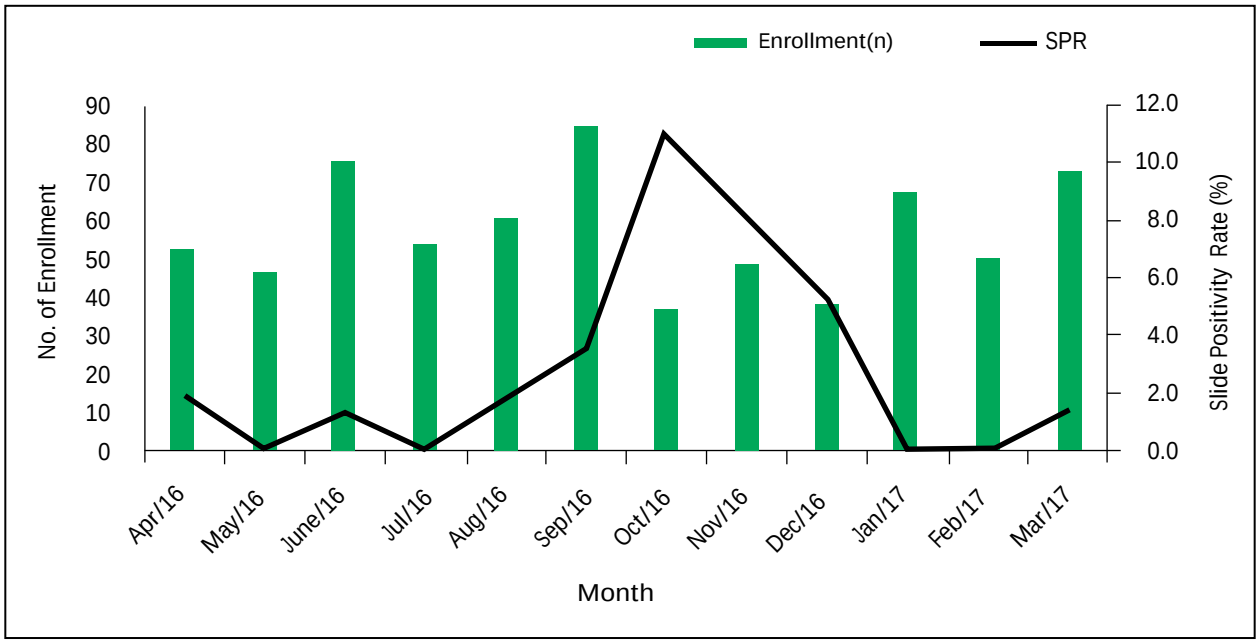


Figure 2.6.1: Showing total no. of month wise enrollment and Slide positivity rate in Ranapur CHC, Jhabua

In SMT group site, Meghnagar, CHC, a total of 611 pregnant women were enrolled during the study period. Out of 611, 88 women were having fever or history of fever for last 14 days; and they were subjected for malaria parasite test. A total of 8% (7/88) pregnant women were found positive for malaria, of which 86% (6/7) had *P. falciparum*, 14% (1/7) had *P. vivax* (Figure 2.6.2). Hb profiling was done as per the routine clinical procedure, at the time of enrollment, most of the pregnant women were having moderate anaemia 90% (549/611), 7.4% (45/611) had mild anaemia and 1.5% (9/611) had severe anaemia. A total of 334 deliveries had been recorded in the CHC, out of which 74% (246/334) deliveries have been successfully attended in the hospitals and rest 26% (88/246) were missed. Four mothers were positive (1.6%) for malaria at the time of delivery admission and all had *P. falciparum* infection.

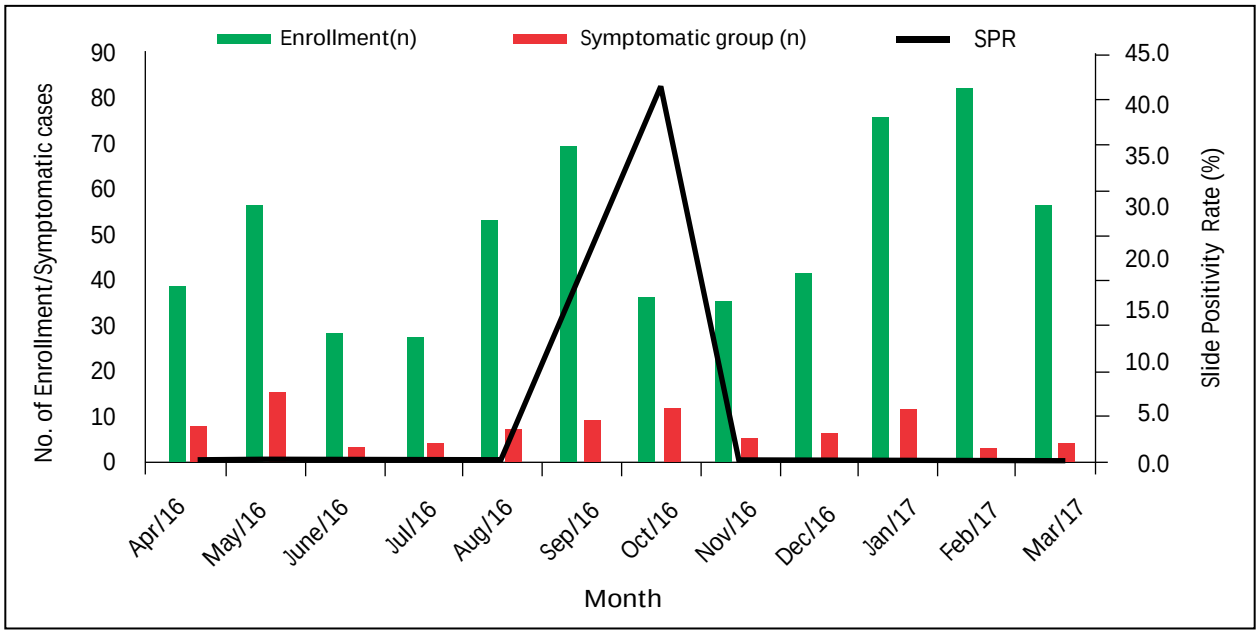


Figure 2.6.2: Showing month wise enrollment, symptomatic group screening and slide positivity rate from Meghnagar CHC, Jhabua

This study showed that in both IST and SMT groups the malaria positivity rate was same. Anaemia profile of the pregnant women in the area indicates high prevalence of under nutrition status.

2.7. EVALUATION OF MASS DRUG ADMINISTRATION IN DISTRICT PANNA

Principal Investigator	:	Dr. Gyan Chand
Status	:	Completed
Funding	:	Intramural

In order to achieve the goal of Filariasis elimination by 2020 mass drug administration of diethylcarbamazine citrate & albendazole is being given once annually in 11 endemic districts of Madhya Pradesh. Status of infection in human population and infection and infectivity in vector was assessed during 2013 to 2015 with the objective to assess the microfilaria (mf) prevalence after several round of annual mass drug administration in sentinel and spot check sites. Institutional scientific advisory committee (SAC) meeting in 2015 also suggested to carry out mf survey in highly endemic Panna district particularly at sentinel villages and spot check villages in collaboration with district program officer.

Mf survey was carried out after 12th round of MDA in November 2016. Seven villages were surveyed of which three were sentinel sites, two were spot check sites and two sites we selected randomly. Blood smear (thick) was prepared taking 60 µl of peripheral blood by finger prick method

on clean glass slide. Slides were stained and examined for the presence of microfilaria. Two thousand two hundred and ninety seven persons were examined from these villages. Mf prevalence varied from 0.8% (sentinel village- Badwara) to 13.6% (spot check village Nardha) (Table 2.7.1). Age group wise analysis revealed that all the age groups had microfilaria in the peripheral blood. Children, below ten years of age who borne after initiation of MDA had 2% mf prevalence, which is a matter of concern (Figure 2.7.1). Lists of positive persons were provided to district program officer for necessary action. The finding of study showed that the impact was not encouraging.

Table 2.7.1: Microfilaria prevalence in study villages

Village	Village category	Mf %
Simaria	Sentinel site	5.8
Singh pur (Taroni)	Sentinel site	9.8
Badwara	Sent inel site	0.8
Nardha	Spot check site	13.6
Pahadi Kheda	Spot check site	2.4
Bisani	Random site	10.9
Beera	Random site	12.9

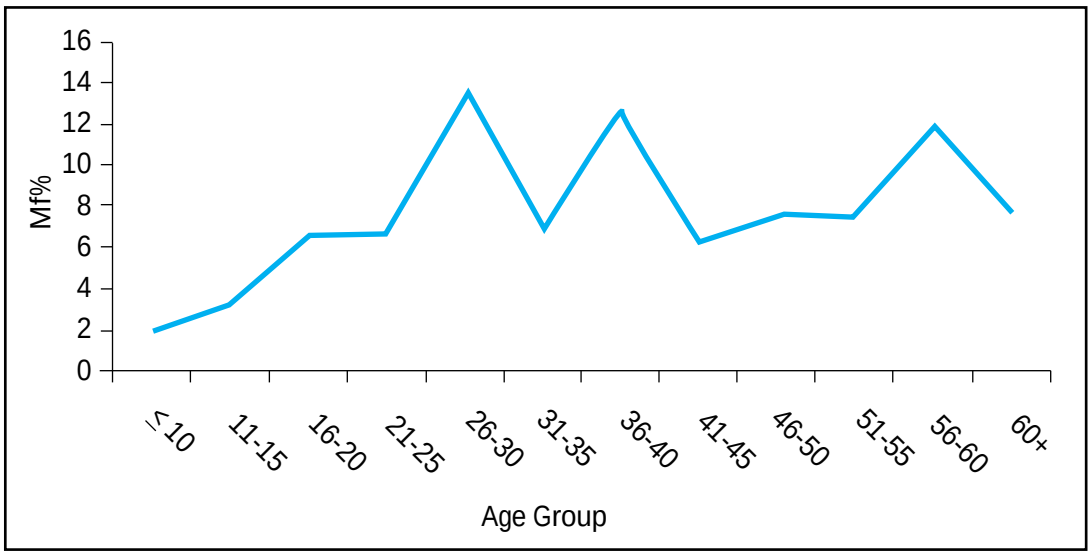


Figure 2.7.1: Age group wise microfilaria prevalence in study villages.

The high microfilaria prevalence in the community after several annual round of mass drug administration highlights the difficulties of lymphatic filarial elimination program by 2020. The study further highlights the need to relook the current program and possibilities for direct observation therapy instead of distributing the drug.

Division of Virology and Zoonosis

Division of Virology and Zoonosis is involved in diagnosis and research of more than twenty viruses of public health importance using serological and molecular tools. The division is National Vector Borne Disease Control Programme (NVBDCP) designated as Apex Referral Laboratory for Dengue and Chikungunya for Madhya Pradesh and Chhattisgarh. The Laboratory is known for timely and accurate diagnosis following standard operating procedures. Several important projects focusing on Dengue Rapid Diagnostic Tests, Viral Hemorrhagic fevers, Respiratory infections *etc.* are in progress

Dr Pradip V Barde has more than 21 years of experience in virology. His research interests are arboviruses, diagnostic virology, virus vector interactions and Biosafety. At present he is involved in establishing virus research and diagnostic facility at this institute. He plans to take up epidemiological, virus isolation and characterization studies in near future.

Dr. Manjunathachar H V is having 6 years research and diagnostic experience on various zoonotic diseases, functional characterisation of tick vaccine candidates through *in-vitro* gene silencing (RNAi) and *in-vivo* system. His future plan is to work on zoonotic/tick borne diseases to mitigate the problem.

3. VIROLOGY & ZOONOTIC DISEASES

3.1. NATIONAL HOSPITAL BASED ROTAVIRUS SURVEILLANCE NETWORK

Principal Investigator	:	Dr. Jyothi Bhat
Status	:	Completed
Funding	:	ICMR, New Delhi

Nationally representative data on rotavirus burden and its strains in India are needed to understand the potential health benefits of rotavirus vaccination. Hence a multi-centric study was initiated to establish a national hospital based surveillance to examine the long term trends and pattern of diarrhea, attributable to rotavirus among children < 5 years of age at in-patient facilities. The study was aimed to determine the age-wise, seasonal distribution, outcomes of rotavirus-associated disease and to characterise (G & P genotyping) prevalent strain of rotavirus or strains not identified/typed by standard techniques among the population under the surveillance.

The samples were collected from Netaji Subhash Chandra Bose Medical College, Jabalpur and Kamla Nehru Medical College, Bhopal. Inpatient children below 5 years of age suffering from acute diarrhea were enrolled and stool samples were collected. Stool samples were processed for ELISA for detection of rotavirus group A as per the kit protocol (Premier Rotaclone, USA). RNA was extracted and cDNA was prepared using standard procedures. Group specific *VP6* gene based diagnostic PCR was used for molecular detection of rotavirus group A. Further, for G & P typing, the respective *VP7* and *VP4* based multiplex PCR was done with reported primers. The *VP6* full length gene was amplified for the additional characterisation of circulating strains.

The genes of rota virus A (RVA) were amplified (Figure 3.1.1) and sequenced by Big dye terminator v3.1 Cycle Sequencing Kit (Applied Biosystems Inc, CA, USA). The retrieved sequences from amplicons of RVA *VP4, VP7* and *VP6* were analysed through RotaC online server for RVA classification. For phylogenetic analysis, initial 15 sequences with maximum similarity were selected.

Total 475 patients were enrolled from NSCB, Medical College, Jabalpur and 518 patients from KNGMC, Bhopal as per the Vesikari Score. A total number of 631 samples were collected, of which 341 samples were from NSCB Medical College, Jabalpur and 290 from KNGMC, Bhopal.

Out of 631 samples, 147 were positive for RVA ELISA. Among these, 94 (27.57%) were from NSCB, Jabalpur and 53 (18.28%) from KNGMC, Bhopal. For molecular characterization through *VP6* gene based diagnostic RT-PCR, 101 positive samples were processed for cDNA synthesis. The respective amplicons of *VP4, VP7* and *VP6* were amplified in randomly selected samples (Figure 3.1.1 - 3.1.3).

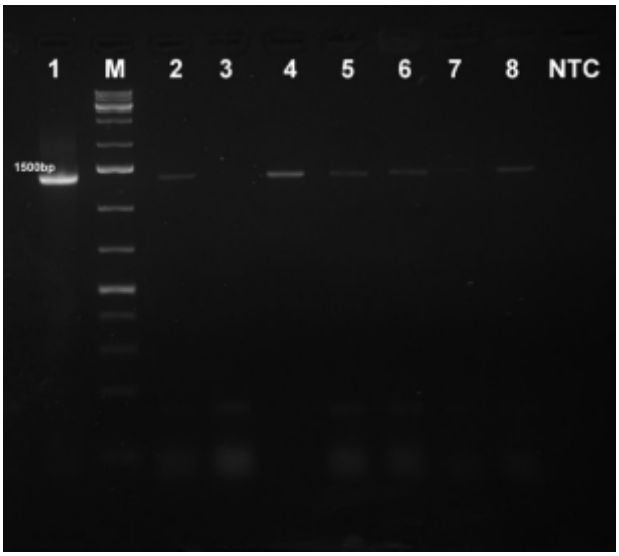


Figure 3.1.1: Agarose gel electrophoresis showing *VP6* gene amplicon (Lane M: 1kb plus DNA ladder, Lane1: BPL92, Lane2: JBP265, Lane3: BPL132(Neg), Lane4: JBP178, Lane5: JBP211, Lane6: JBP209, Lane7: BPL182, Lane8: JBP186, Lane9: NTC)

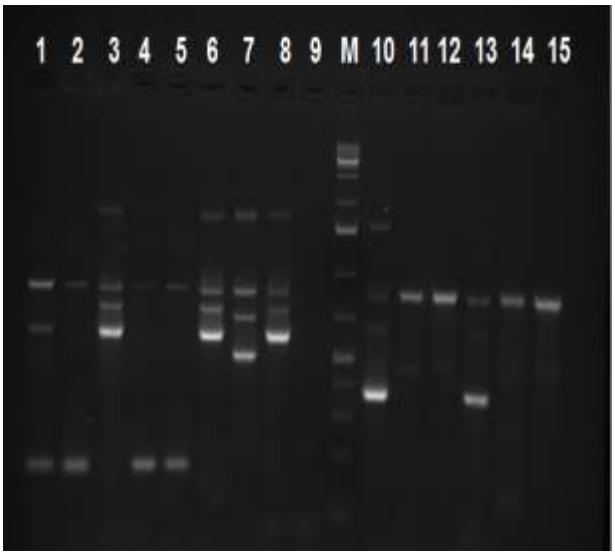


Figure 3.1.2: Agarose gel electrophoresis showing amplicon sizes for the different G-types (Lane1 and 10: G1G9G12 (BPL92), Lane2 and 11: G9 (BPL111), Lane3 and 12: G1 (BPL132), Lane4 and 13: G9G12 (BPL135), Lane5 and 14: G9 (BPL144), Lane6 and 15: G1 (BPL155), Lane7 and 16: G2 (BPL182), Lane8: G1 (BPL52), Lane9: NTC, Lane M: 1kb plus DNA ladder)

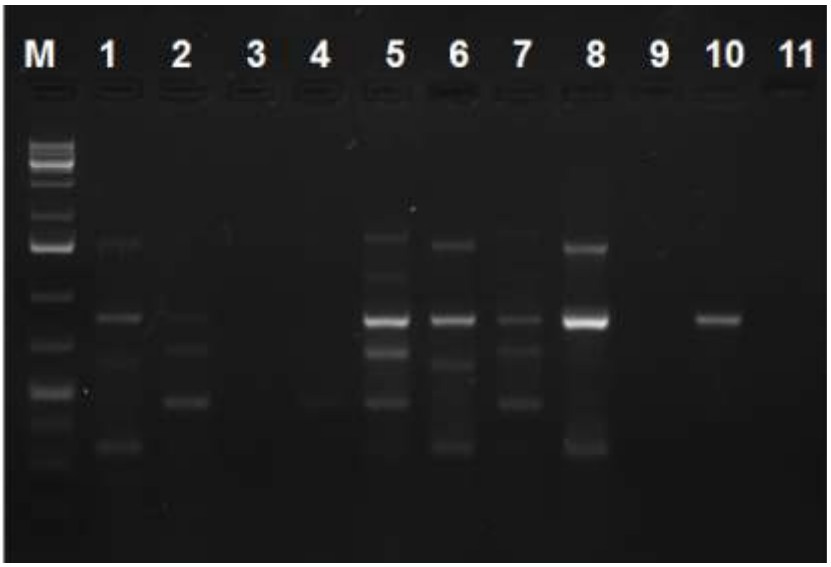


Figure 3.1.3: Agarose gel electrophoresis showing amplicon sizes for the different P types (Lane M: 1kb plus DNA ladder (Fermantas), Lane1: P8 (BPL92), Lane2: P4 (BPL111), Lane3: Pnt (BPL132), Lane4: P4 (BPL135), Lane5: P4 (BPL144), Lane6: P8 (BPL155), Lane7: P4 (BPL182), Lane8: P8 (BPL52), Lane9: Pnt (BPL57), Lane10: VP4 CTRL, Lane11: NTC)

In respect to the predominance of G & P type strain, G1P [8] was the most common (19.80%) strain and the most dominant G-type was G1 (32.43%), followed by G9 (11.88%). Whereas, 40.6% samples were having mix G-types strain (G1G4, G1G8, G1G9, G1G12, G4G12, G9G12, and G1G2G9). In case of P-typing; P8 strains were most prevalent (39.6%), followed by non-typed VP4 (28.7%).

Amplified *VP4, VP6* and *VP7* genes were sequenced by Sanger method. The retrieved sequences were genotyped with RotaC server. The result of *in-silico* analysis was same as the wet lab result. For further characterizsation of *VP4, VP6* and *VP7* genes, the sequences were aligned with their respective type strains. All *VP4* and *VP7* genes showed 99% similarity with Indian strains (Figure 3.1.4 - 3.1.6).

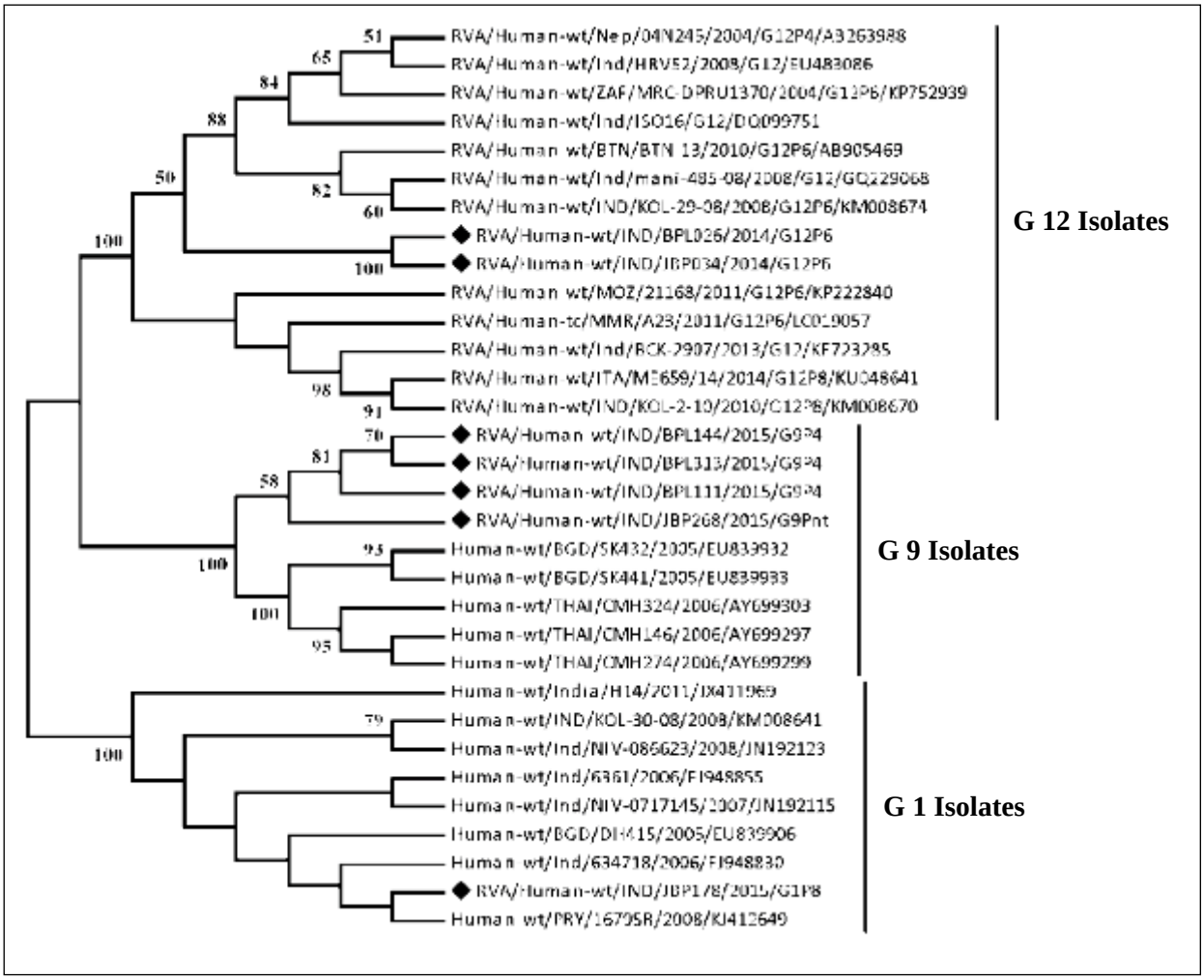


Figure 3.1.4: Phylogenetic analysis of *VP7* rotavirus group A virus isolate from central India with other rotavirus group A isolates (Studied isolates are highlighted in black dot. The phylogenetic analysis was completed with MEGA5.0.5 software that used a neighbor-joining algorithm and absolute distances and that followed 2,500 bootstrap replicates. The tree is based on the complete cds of *VP7* gene)

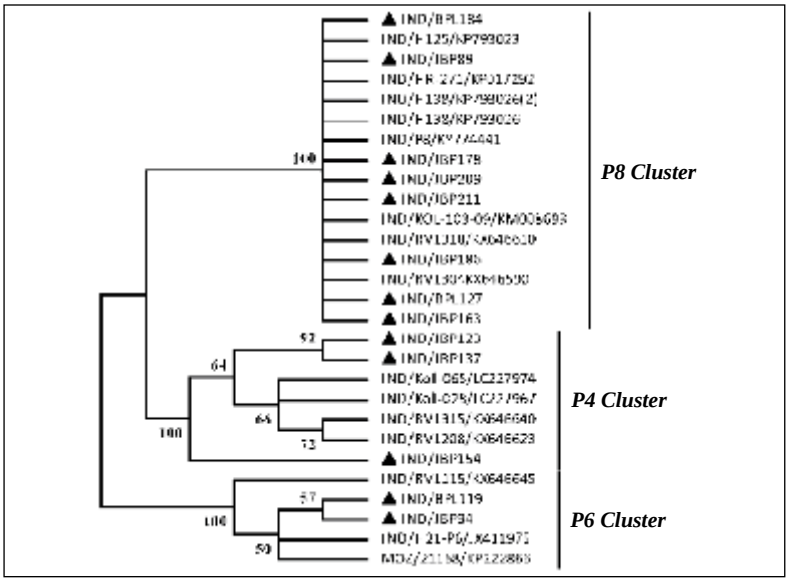


Figure 3.1.5: Phylogenetic analysis of VP4 rotavirus group A virus isolate from central India with other rotavirus group A isolates (Studied isolates are highlighted in black dot. The phylogenetic analysis was completed with MEGA5.0.5 software that used a neighbor-joining algorithm and absolute distances and that followed 2,500 bootstrap replicates. The tree is based on the partial cds of VP4 gene)

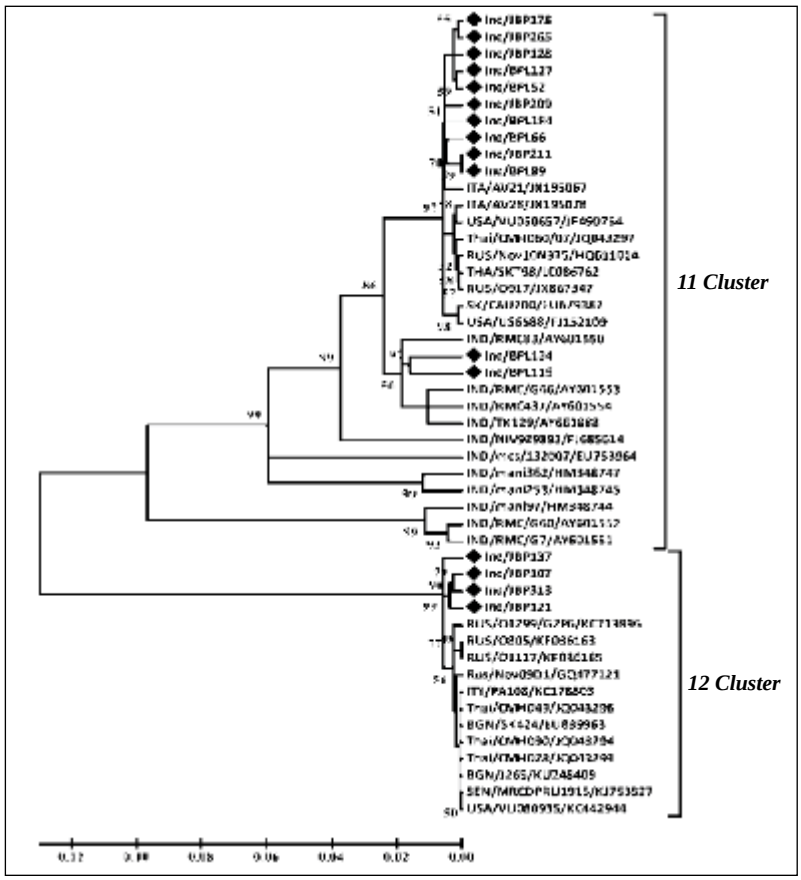


Figure 3.1.6: Phylogenetic analysis of VP6 rotavirus group A virus isolate from central India with other rotavirus group A isolates (Studied isolates are highlighted in black dot. The phylogenetic analysis was completed with MEGA5.0.5 software that used a neighbor-joining algorithm and absolute distances and that followed 2,500 bootstrap replicates. The tree is based on the complete cds of group specific VP6 gene)

The sequenced *VP6* gene were resulted as I1 and I2 typed *VP6* by using web based automated RotaC classification software (Maes et al., 2009). The retrieved sequence of *VP6 I1* type genes showed 98% similarity with Russian and Thailand strains. On the other hand, *VP6 I2* type genes showed maximum similarity with Bangladesh and USA strains. The remarkable and unique information that came out from the study is that *I1 VP6* which was reported only from north-east region of India and Bangladesh is also circulating in this area with most common I2-type *VP6*.

Among hospitalised children Rotavirus contributes for more than one-fifth diarrhea cases and G1P8 is the most prevalent strain type. I1-type VP6 is circulating in this area which was earlier reported only from the north-east region of India. This epidemiological information would be very important to assess the effect of Rotavirus vaccine in the area.

3.2 ESTABLISHMENT OF GRADE II VIROLOGY LABORATORY UNDER ICMRS VIROLOGY LABORATORY NETWORK AT ICMR-NIRTH, JABALPUR, MADHYA PRADESH

Principal Investigator	:	Dr. Pradip V. Barde
Status	:	On going
Funding	:	ICMR, New Delhi

The grade II virus research and diagnostic laboratory (VRDL) with biosafety level 2 (BSL-2) is providing diagnosis using serological and molecular diagnosis, and conducting research on the viruses of public health importance at NIRTH since December 2011. Initially, the laboratory was providing diagnosis for Influenza *A H1N1pdm09* and dengue viruses; however over the period other viruses awere also added to the list. Now the laboratory is equipped to provide molecular and serological diagnosistic services to 20 viral diseases of public health importance and conducts outbreak investigations, research on these viruses. The standard operating procedures and reagents recommended by resource centre of Virus Research and Diagnostic Laboratories network, WHO, Centre for Disease Control (CDC), USA, National Institute of Virology (NIV) and NVBDCP *etc.* are used for testing these samples.

The samples are referred from almost every district of Madhya Pradesh and few districts of Chhattisgarh for testing to this laboratory. The reports are provided to the patients, health authorities and the national programme on daily basis both manually and electronically. The generated data is regularly uploaded to online data entry software developed by Resource Centre of National Institute of Epidemiology, Chennai.

The NIRTH-VRDL acts as nodal laboratory for state of Madhya Pradesh for Influenza *AH1N109 (H1N1)* diagnosis and conducted training for doctors and technicians on dengue and chikungunya diagnosis by ELISA which is sponsored by SVBDCP. The commencement of *H1N1* diagnosis Bhopal, Gwalior and dengue and chikungunya diagnosis at 19 district lLabs has reduced turnaround time and is helping patients and programme. VRDL, NIRTH is also monitoring the

quality of diagnosis provided by these labs for dengue and advises them time to time and assisted WHO in serosurvey of polio for MP. This year the staff members from the laboratory were trained at Resource Centre of NIV Pune for conducting Zika virus RT PCR and qRT-PCR, Trioplex qRTPCR etc and thus few more viruses are added to the diagnostic panel.

During the report writing period, more than 3,000 samples were referred to the VRDL for diagnosis by different government authorities (Figure 3.2.1). The samples were also collected proactively by visiting the hospitals. These samples were tested using symptomatic approach and more than 7,700 tests were conducted. The disease/virus wise details of the samples tested and found positive are presented in graph and discussed in detail in the text.

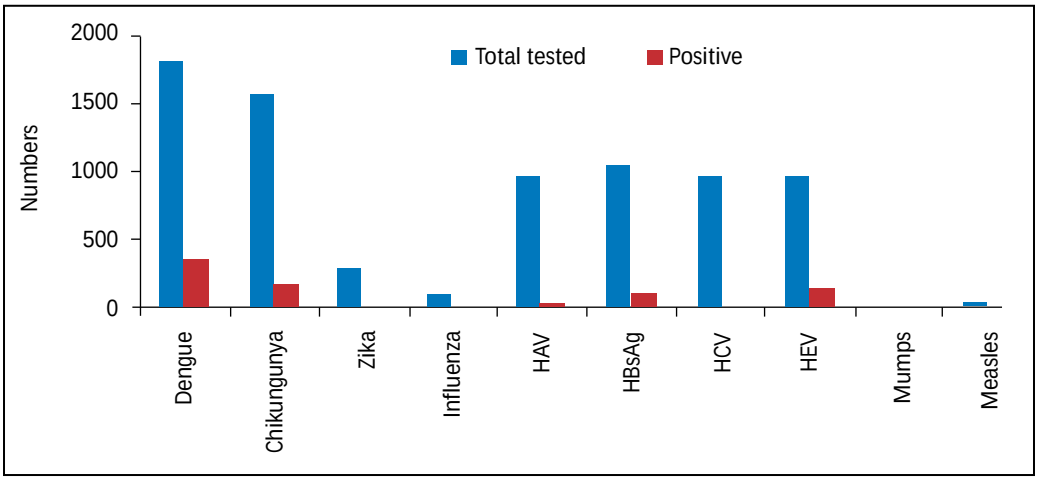


Figure 3.2.1: Graph showing total samples tested and positive for important diseases from Apr 2016-Mar 2017

This year, 1,799 samples were tested for dengue, out of which 354 were found positive. 80 patients were admitted to different hospitals and two deaths were recorded. Persons of 16-45 years of age group were found to be the worst affected. Males were more affected (23.3%) in comparison to females. Maximum positive cases (32.0%) were detected in the month of September. Peak of cases was observed during monsoon and post-monsoon seasons (July-November, 2016).

Four dengue outbreaks were also investigated during this period. The details of the samples collected and found positive are given in table. Out of total samples, 263 were collected during outbreaks and 133 (50.6%) were detected positive for DEN (Table 3.2.1). Highest attack rate of 38 per thousand along with lowest IgG positivity of 3.6% was observed during the outbreak in rural areas of Morena district, whereas lowest attack rate of 0.5 per thousand with highest IgG positivity of 35.7% was found during an urban outbreak in Katni district. Except Katni, other three outbreaks were in villages and occurred in the post monsoon period. Door to door vector surveillance by our Rapid Response Team in the area revealed that unused containers/utensils, cement tanks, air coolers and water stored in the toilets were the main mosquito breeding sites. Adults mosquitoes emerged from larvae and pupas were collected from outbreak area and identified as *Aedes aegypti*.

Table 3.2.1: Description of DEN positivity serotypes detected and IgG positivity during Outbreaks

Sr. No.	District	Samples tested	DEN Positive N (%)	Serotype detected	IgG % (IgG positive /NS1 positive)
1	Morena	76	47(61.8)	DENV-3	3.5(1/28)
2	Sehore	19	11(57.9)	DENV-3	12.5(1/8)
3	Damoh	144	56(38.9)	DENV-3	25.0(5/20)
4	Katni	24	19(79.2)	DENV-2	35.7(5/14)
Total		263	133 (50.6)		

The qRTPCR for dengue serotyping was done on 80 NS1 positive samples and 71 of which were sero-typed. Maximum sero-typed (n=33) were dengue virus 3, followed by dengue virus 2 (n=18), dengue virus 1 (n=17), and only one sample was detected having dengue virus 4. One sample was detected having dual infection of dengue virus 2 and dengue virus 3. We successfully sequenced 11 samples of different serotypes [DENV1, 5 numbers (GenBank Acc no KY315509-KY315513), DENV2, 2 numbers (GenBank Acc no KY315514 and KY315515), DENV3, 3 numbers (GenBank Acc no KY315516 to KY315518) DENV4, 1 number (GenBank Acc no KY315519)]. DENV-3 (KY315519) which was dominant during the study period showed maximum (99.7%) homology with the sequence (GenBank Acc no KY315516) reported from Singapore in 2013. DENV-3 detected in 2016 belonged to the lineage C of genotype III. DENV-4 detected in 2016 (GenBank Acc no KY315519) showed 98.3% identity with DENV-4 detected in 2010 from Central India (GenBank Acc no JF929180) and belonged to genotype-I. The phylogeny analysis conducted on sequences of DENV-1 and DENV-2 revealed that they belonged to Genotype III and Cosmopolitan genotype respectively.

Chikungunyia is characterised by an abrupt onset of fever frequently accompanied by joint pain; muscular pain, rash and headache are the other common features. It is most of the times not a life threatening infection but can be confused with dengue. We have tested 1,595 samples for Chikungunya, 172 were found positive, and most of them have reported major complaints as joint pain and muscular pain.

The VRDL has tested 290 samples for Zika virus out of which none of these was found positive during report year (April 2016- March 2017).

During the study period, only 84 samples of Influenza were referred and tested. Which is very less compared to previous year's referral. Among them, 5 samples were positive for Influenza A H1N1 pdm09 and 2 for seasonal influenza A virus. Human Respiratory Syncytial Virus (*hRSV*) is a common respiratory virus that affects persons of all ages. Although no sample was received for Respiratory Syncytial virus testing this year, however, samples received by the institute from different districts of Madhya Pradesh for influenza A(H1N1)pdm09 diagnosis during the pandemic and post pandemic period of influenza-A H1N1(pdm09) were used for molecular characterization of hRSVs. Sequence analysis of 15 samples revealed circulation of genotypes NA1, ON1 of hRSV-A, and BA9 of hRSV-B. The Phylogenetic tree derived from Neighbor joining method is shown in Figure 3.2.2A and 3.2.2B.

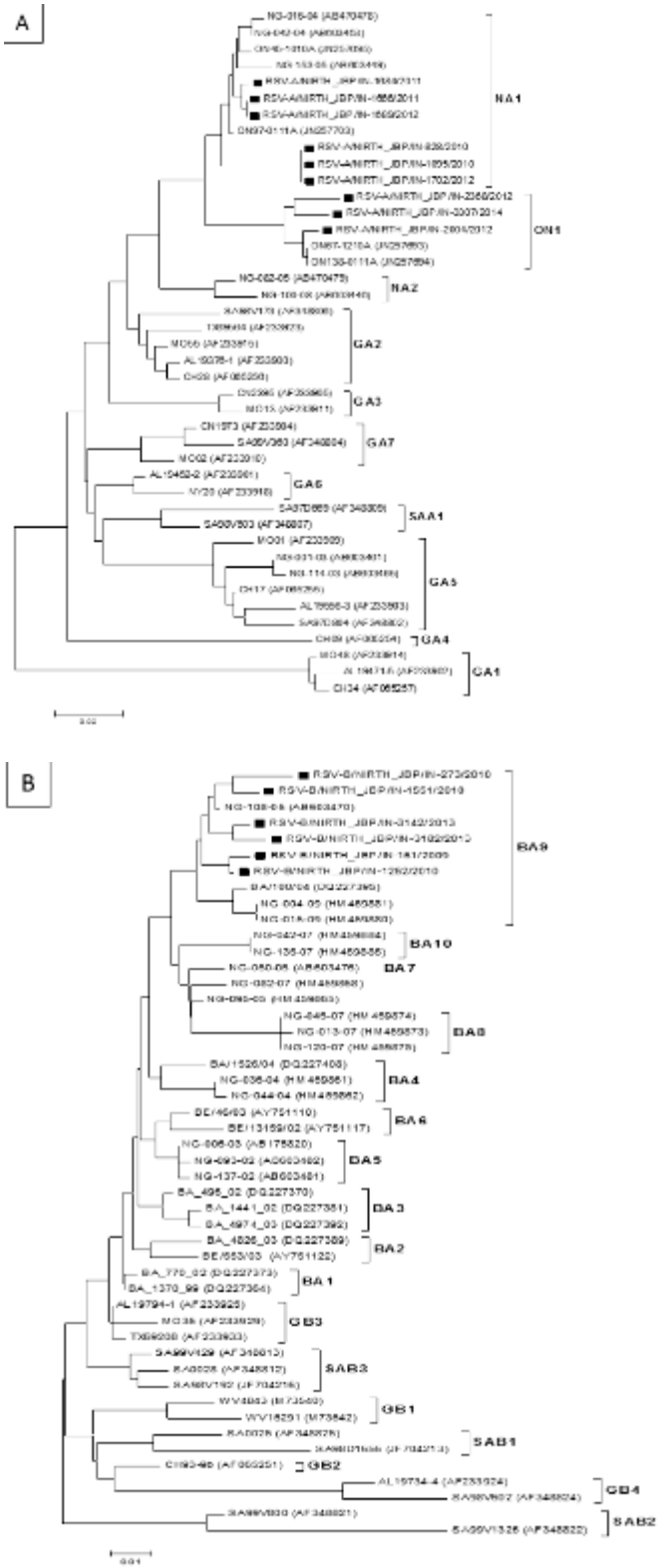


Figure 3.2.2: Showing phylogenetic tree for partial nucleotide sequences of second hyper variable region of the G gene of strains RSV-A (Fig. A) and RSV-B (Fig. B) from Madhya Pradesh (Multiple sequences alignment and phylogenetic tree was constructed using Claustal W and Neighbor-joining algorithm using MEGA 5.05 software. The evolutionary distances were computed using the p-distance method. Sequences from this study are indicated by black solid square (P). GenBank accession no. of reference strains representing known genotype are indicated at the right by bracket)

This year we have tested 975 samples for Hepatitis, out of these 30 samples were found positive for Hepatitis A IgM antibodies. One hundred and five out of 1,046 samples tested were *HBsAg* positive indicating Hepatitis B virus infection. Twelve samples were detected positive from 960 samples tested for Hepatitis C. Maximum positivity of 154 positive samples out of 983 samples tested was observed for the Hepatitis E virus IgM antibodies.

Clinical picture of Measles and Rubella is almost same as both of them present with fever and rash over the body while in Mumps swelling of parotid gland is visible. These viruses can cause congenital anomalies if acquired during the pregnancy. This year, we received only 18 samples for Measles testing out of them 3 were found positive, whereas no sample was received for Mumps and Rubella. Herpes Zoster and the Herpes Simplex virus are causes of rashes. HSV causes herpes which can appear in various parts of the body, most commonly on the genitals or mouth as cold sores and fever blisters. HZV also causes painful skin rash. Out of 13 samples received for HSV testing, none was found positive.

More than 3,000 samples were tested during April, 2016- March, 2017. This year Dengue virus 3 was dominant serotype. The sequence analysis of Human Respiratory Syncytial Virus (hrsv) revealed circulation of genotypes NA1, ON1 of hrsv-A, and BA9 of hrsv-B.

3.3. 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. Pradip V. Barde
Status	:	On going
Funding	:	CDC-NIV, Pune

The emerging and re-emerging viral infections resulting in hemorrhagic fevers are causing serious morbidity and high mortality in India. Most of these viruses are vector borne and are capable of causing outbreaks of high magnitude. Viruses such as Dengue, Chikungunya, Kyasanur forest disease virus, Crimean Congo hemorrhagic fever virus are detected in the country, and more recently Zika virus too has marked its presence in the country. It is very important to diagnose these viruses as early as possible to prevent then to cause serious outbreaks in public health. With the view, CDC-NIV is establishing a network of laboratories to establish diagnostic network for high-risk group viral pathogens causing viral hemorrhagic fevers and to enhance bio-risk mitigation awareness in public health community.

The project and permanent staff were trained on various aspects of Biosafety measures, diagnosis, data entry and management at NIV Pune. Diagnosis of Dengue, Chikungunyia and Zika virus was initiated as first phase of the project. As per the inclusion criteria patients having symptoms such as fever with more than one of following symptom that is joint pain, headache, retro-orbital pain/ pain behind eyes, abdominal pain vomiting, jaundice, skin rash muscle pain nausea haemorrhage *etc.* and admitted to hospital were included in the study. The serum samples were collected at the hospital and transferred to the laboratory in cold chain. The serum samples were tested by CDC developed Trioplex qRTPCR for presence of RNA of dengue, Chikungunyia and Zika viruses or for presence IgM by NIVs IgM captures ELISAs for dengue and chikungunya. Clinical and demographical data was collected from hospital in the format provided by NIV, Pune by interviewing patients and cross checked by the corresponding physicians.

This year 459 samples from the suspected hospitalised patients were tested. The 111 samples collected during acute phase of illness (between 0 to 5 days of illness) were tested using CDC Trioplex qRT-PCR kit and 348 samples collected after 5th days of illness were subjected to dengue IgM ELISA and Chikungunyia IgM ELISA. The samples were collected/referred from different districts of Madhya Pradesh.

Out of total 459 samples, 112 samples were found positive. Among these positive samples, 72 (16%) samples were positive for dengue (25 by CDC-qRT-PCR, 54-IgM ELISA), 30 (6%) samples were positive for Chikungunyia (05-CDC-qRT-PCR, 25-IgM ELISA), 10 (2%) samples were found positive for both dengue and Chikungunyia by IgM ELISA (Figure 3.3.1).

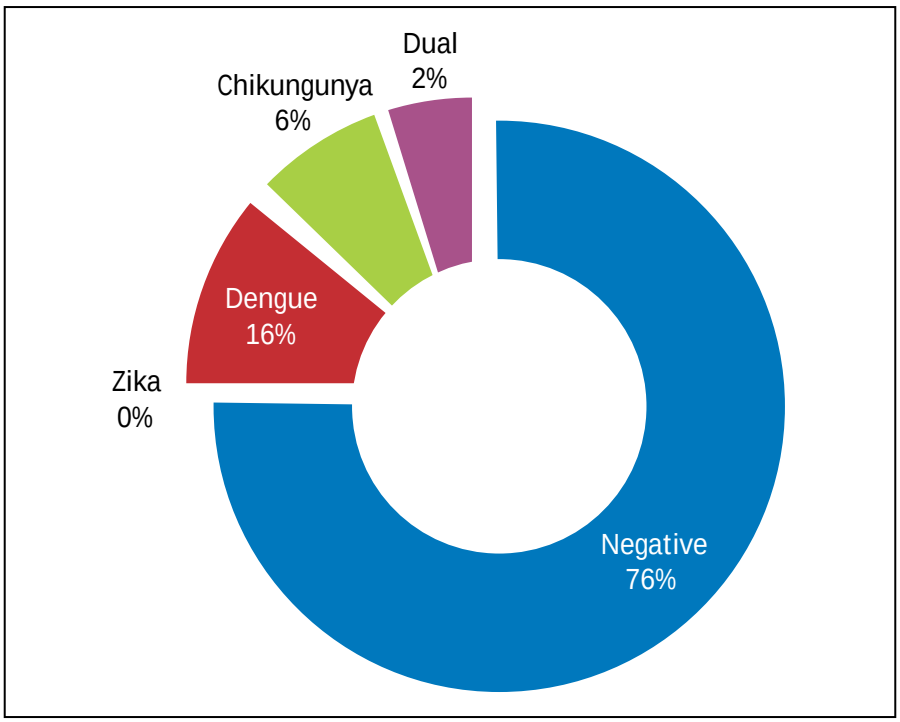


Figure 3.3.1: Total sample tested and found positive samples for various viruses

Gender wise positivity showed that 17.6% males and 13.6% females were positive for dengue infection, whereas 8.4% males and 4.5% females were found positive for chikungunya infection and 2% males and females were having IgM antibodies for both dengue and chikungunya virus. As compare to females, more males were affected. Most affected age group was 16 to 45 years while 0-5 year's age group was least affected.

Clinical picture of the positive patients is described in Figure 3.3.2. Fever was the common complaint by the patients with all the three types of infections, whereas vomiting (18%), jaundice (11%) and skin rash (15%) were observed more in dengue and haemorrhagic manifestations were also observed in two cases of dengue. In chikungunya cases fatigue (67%), joint pain, headache (73%), and abdominal pain (17%) were more prevalent.

Pathological and biochemical observations are described in Figure 3.3.3. Lymphocyte count, platelet count, serum bilirubin, SGPT and serum protein were affected more in dengue infected patients whereas haemoglobin, total leukocyte count, serum globulin, creatinine and blood urea were affected more in chikungunya infected patients, while in patients with dual infection having dengue and chikungunya, SGOT and albumin were observed to be affected more.

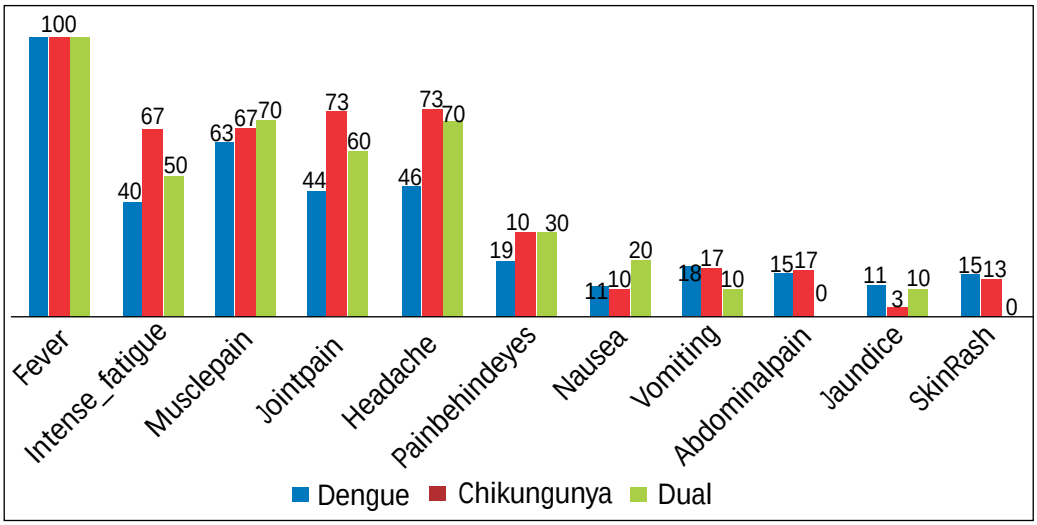


Figure 3.3.2: Clinical symptoms of dengue, chickungunya and dual positive samples

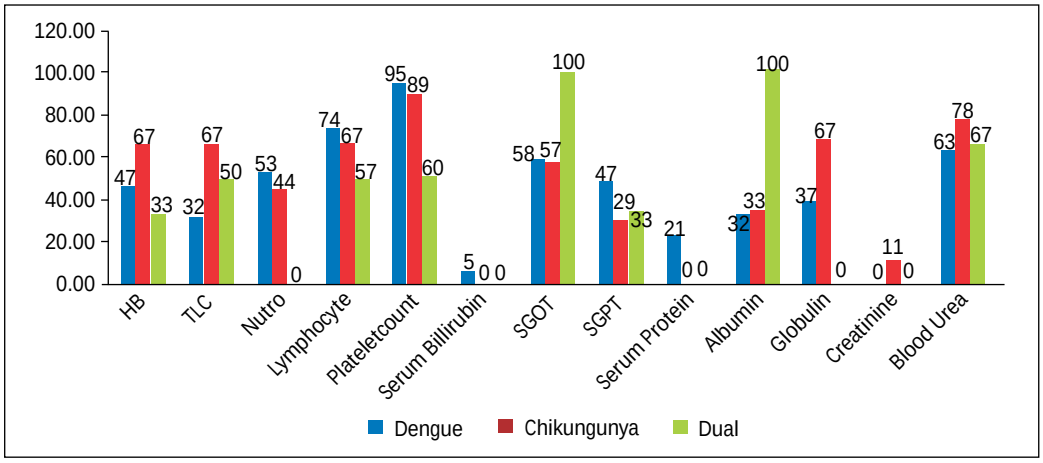


Figure 3.3.3: Pathological and Biochemical characteristics

Out of 459 samples, 22 negative samples were shared with NIV, Pune for the detection of other haemorrhagic disease causing virus that is KFD and CCHF virus, which were found negative for the same. Ten percent positive samples of dengue and chikungunya were also shared with NIV, Pune for quality check.

The virology laboratory participated in CDCs qRTPCR Trioplex validation and successfully completed the validation panel tests with 100% concordance. The virology laboratory also helped in evaluation of ELISA and qRT-PCR kits developed by NIV Pune for CCHF, KFD etc. The testing for other viruses responsible for causing hemorrhagic fever will be initiated soon.

The project helped in collection of clinical data of hemorrhagic fever cases. It has also helped in diagnosis of not only Dengue, Chickungunya and Zika infections but also highly pathogenic viruses like CCHF, KFD with the help of National Institute of Virology.

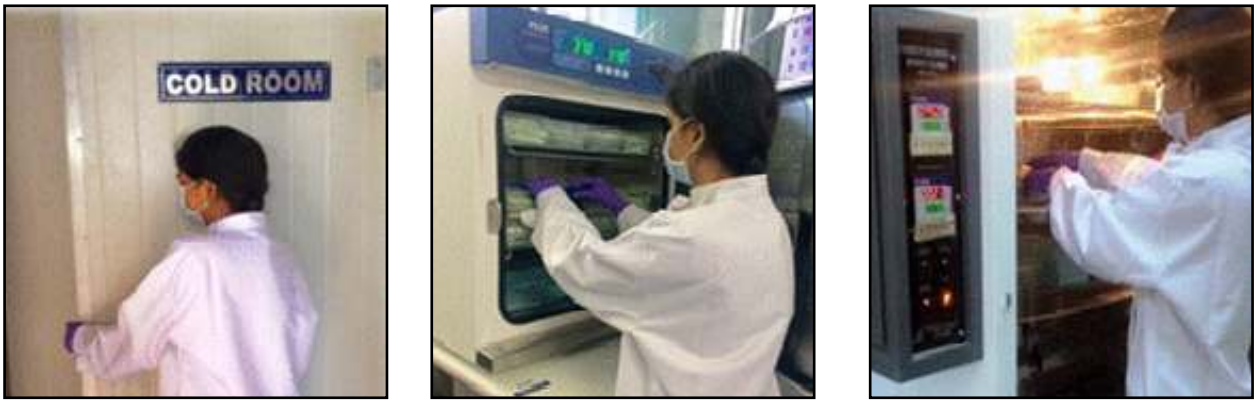
3.4. EVALUATION OF RAPID DIAGNOSTIC TESTS OF DENGUE FOR USE IN RURAL AND TRIBAL AREAS OF MADHYA PRADESH

Principal Investigator	:	Dr. Pradip V. Barde
Status	:	On going
Funding	:	State Tribal Welfare Department, M.P.

Dengue is an emerging problem in rural and tribal areas. The outbreaks and sporadic cases are reported from tribal dominated, difficult to reach regions. Early diagnosis can be helpful not only in patient management but also in avoiding outbreaks. The National Vector Borne Disease Programme recommends ELISA and RT-PCR for diagnosis of dengue; however it is not possible to conduct these tests in rural settings. Rapid diagnostic tests can be good tool in such situations as these are easy to conduct in minimal laboratory settings by adequately trained staff, but owing to low and varying low sensitivity and specificity, the NVBDCP does not recommend the use of RDT for dengue diagnosis. This study is planned to evaluate and demonstrate the utility of commercially available rapid diagnostic tests (RDT) in tribal and rural area.

The samples from patients suspected of dengue as defined by NVBDCP are being collected from rural and tribal areas of Madhya Pradesh. These samples are preferably tested in the field itself using commercially available RDTs for presence of NS1 antigen and/or IgM antibodies based on days of onset of symptoms. The samples are then transported to the laboratory maintaining cold chain and are further tested by ELISA, qRTPCR and RDTs stored at different temperatures (4°C, 37°C and 45°C) (depicting through Photographs). The samples collected in acute phase of illness and found positive by qRTPCR are also serotyped to evaluate serotype specific sensitivity and

specificity. The generated data is analysed using statistical tests. This year so far, 100 samples collected/referred from 19 districts of MP are subjected to the analysis using three commercially available RDT kits (Photographs). The results are summed up in the tables (Table 3.4.1 & 3.4.2). Further work on serotype specific analysis and testing of more samples to archive desired sample size is in progress.



The storage of kits at different temperatures prior to evaluation

Testing of RDTs Kits in the laboratory

Table 3.4.1: Comparison of NS1 RDT with NS1 ELISA

Comparison of NS1 RDT with NS1 ELISA*																	
Kit 1						Kit 2						Kit 3					
4°C		37°C		45°C		4°C		37°C		45°C		4°C		37°C		45°C	
SE	SP	SE	SP	SE	SP	SE	SP	SE	SP	SE	SP	SE	SP	SE	SP	SE	SP
90	97	90	97	90	97	90	97	95	97	88	96	100	96	100	96	100	96
NS1 RDT WITH qPCR**																	
Kit 1						Kit 2						Kit 3					
4°C		37°C		45°C		4°C		37°C		45°C		4°C		37°C		45°C	
SE	SP	SE	SP	SE	SP	SE	SP	SE	SP	SE	SP	SE	SP	SE	SP	SE	SP
73	92	73	92	75	92	78	93	81	90	75	90	87	90	87	90	87	90

Table 3.4.2: Comparison of IgM RDT with IgM ELISA

Kit 1						Kit 2						Kit 3					
4°C		37°C		45°C		4°C		37°C		45°C		4°C		37°C		45°C	
SE	SP	SE	SP	SE	SP	SE	SP	SE	SP	SE	SP	SE	SP	SE	SP	SE	SP
78	97	70	98	70	98	72	98	74	97	58	98	50	85	40	85	38	97

*NIVs IgM capture ELISA recommended by NVBDCP was used as Gold Standard; SE=Sensitivity in percent & SP= Specificity in percent

Rapid diagnostic tests can be useful for dengue diagnosis in rural and tribal area. This will be helpful in patient management and outbreak mitigation.

Division of Genetics

Division of Genetics provides free diagnostic services to government referred patients for various hemoglobinopathies. It provides technical support and advice to Madhya Pradesh government and Ministry of Tribal Affairs, GoI for screening and control of Sickle Cell Anemia. Division is equipped with state of art diagnostic equipments like HPLC, gradient PCR and CRDB facilities.

Dr. S. Rajasubramaniam expertise in Molecular biology and cell signalling. His team is currently focussed on providing diagnostic services for various Hemoglobinopathies besides training and developing human resources for 19 states with Tribal population in collaboration with Ministry of Tribal Affairs. In future, his team is aiming to develop a non invasive diagnostic procedure for oral cancer.

Dr. Vidhan Jain current research interest focuses on "Malaria vector replacement/reduction through wolbachia - A master invertebrate reproductive manipulator endosymbiont.

Dr Ravindra Kumar has more than 10 year of research experience in molecular hematology especially hemoglobinopathies. His future plans are to identify the spectrum of beta thalassemia mutation in different tribes and develop cost effective screening method for sickle cell anemia.

4. GENETIC DISORDERS

4.1. MICRO MAPPING OF G6PD DEFICIENCY AMONG THE TRIBALS OF INDIA AND ITS IMPORTANCE FOR ANTI-MALARIAL THERAPY

Principal Investigator	:	Dr. Malay Mukherijee, NIIH, Mumbai
PI at NIRTH	:	Dr. S. Rajasubramaniam
Status	:	Ongoing
Funding	:	ICMR, New Delhi

Multi-centric study on Micro mapping of glucose-6-phosphate dehydrogenase (G6PD) deficiency among the tribals of India and its importance for anti-malarial therapy was initiated in January 2015 with the aim to screen for G6PD enzyme deficiency and evaluate the clinical manifestations in the G6PD deficient individuals from different tribal population groups of India, respectively. Moreover, to estimate the level of enzyme deficiency, mutations underlying G6PD deficiency and their distributions, and correlate the clinical findings with the type of mutations present in different tribal population groups. The clinical outcome of this study is expected to help in determining whether the routine G6PD screening is necessary in some of the tribal areas before giving the anti-malarial therapy. The molecular characterisation of this gene is also necessary to determine the genotype – phenotype correlation.

Samples received for malaria testing and samples suspected for G6PD deficiency received from NSCB Medical College were included in the study. Field trips were undertaken in one of the 5 districts included in the study i.e. Dindori district. After obtaining requisite permission and consent from the district authorities, screening was conducted in 12 tribal schools in Dindori ditstrict. The 2mL peripheral blood samples were collected in EDTA vials and G6PD deficiency was done by DPIP decolourization method. Quantiation of G6PD enzyme activity was done in G6PD deficient on screening by measuring the change in OD at 340 nm using a spectrophotometer over a time period of 10 minutes.

During period from April 2016 till March 2017, one thousand three hundred twenty-two tribals including school children were screened. Among 1,322 subjects screened, 61 were found to be G6PD deficient. All G6PD deficient samples were tested for various mutations at ICMR-NIIH, Mumbai or ICMR-NIRTH, Jabalpur. The prevalence of various hemoglobinopathies detected among tribal school children (Figure. 4.1.1).

Mutational analysis of 61 samples was carried out (Figure 4.1.2). Eighteen samples are under process for sequencing.

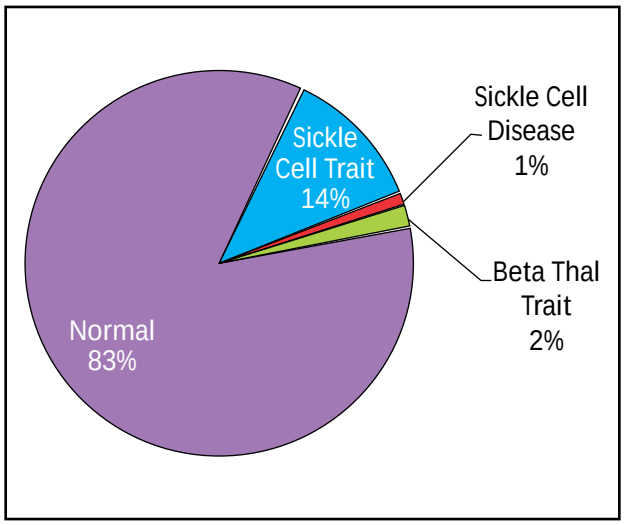


Figure 4.1.1: Prevalence of hemoglobin disorders among tribal school children's

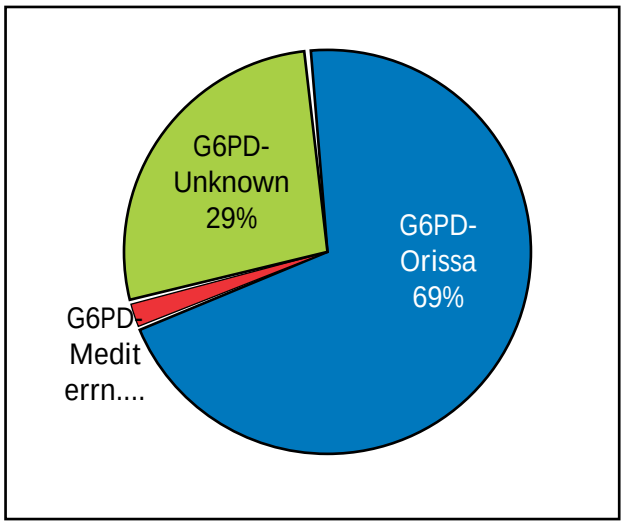


Figure 4.1.2: Spectrum of G6PD mutations

A total of 1,135 samples were screened for a gene deletion (Table 4.1.1). Among these 116 (10.2%) were wild type, 195 (17.2%) were homozygous for $-a-^{3.7}$ deletion, 134 (11.8%) were $-a-^{4.2}$ homozygous deletion, 223 (19.7%) were heterozygous for $-a-^{3.7}$ deletion, 168 were heterozygous for $-a-^{4.2}$ (14.8%) deletion, and 299 (26.3%) were double heterozygote for $a-^{3.7}/-\alpha-^{4.2}$ deletion.

Table 4.1.1: Prevalence of α-thalassemia among tribal school children of Dindori district (April, 2016- March, 2017)

TOTAL	αα/αα	$-\alpha^{3.7}/-\alpha^{3.7}$	$-\alpha^{4.2}/-\alpha^{4.2}$	$-\alpha^{3.7}/\alpha\alpha$	$\alpha\alpha/-\alpha^{4.2}$	$-\alpha^{3.7}/-\alpha^{4.2}$
1135	10.2% (116)	17.2% (195)	11.8% (134)	19.7% (223)	14.8% (168)	26.3% (299)

All the samples were also tested for malaria; only 2 samples among 1322 samples were malaria positive. Further, the family study on deficient samples is being carried out along with screening in Mandla and Damoh districts for representative samples as per project proposal.

Several new G6PD variants identified, highly deficient mutant G6PD Dindori has been fully characterised for its biochemical activities.

4.2. ESTABLISHMENT OF PRENATAL DIAGNOSIS OF β-THALASSEMIA SYNDROMES AND SICKLE CELL DISORDERS IN MADHYA PRADESH, ASSAM AND THE ANDAMAN AND NICOBAR ISLANDS

Principal Investigator	:	Dr. Malay Mukherjee, NIIH, Mumbai
PI at NIRTH	:	Dr. S. Rajasubramaniam
Status	:	Ongoing
Funding	:	ICMR, New Delhi

The main objective of this study is to establish molecular and prenatal diagnosis centres which would be beneficial to tribal populations in 3 regions where the burden of β-thalassemias, HbE-β thalassemias, sickle cell disease and HbS-β-thalassemias are high. Secondly, such facilities are presently nonexistent and hence the tribal couples at – risk need to travel long distances. The proposed facilities will allow couples at risk to undergo screening and avoid birth of genetically abnormal child.

Multi-centric study on "Establishment of prenatal diagnosis of β-thalassemia syndromes and sickle cell disorders in Madhya Pradesh, Assam and the Andaman and Nicobar Islands" was initiated in January 2015. During the report period (April 2016 – March 2017), Molecular studies involving anti-reflux mucosectomy (ARMS), polymerase chain reaction (PCR) and covalent reverse dot blot hybridization (CRDB) procedures have been standardised and initiated in the institute. Registration and license from state health authorities for initiating chorionic villus sampling (CVS) at the institute through the partner NSCB medical college, Jabalpur has been obtained (CLN1608672). Training for CVS sampling of 2 Gynaecologist Dr. Bharti Sahu, MD and Dr. Sonal Sahni, MD (NSCB Medical College, Jabalpur) was completed at AIIMS, New Delhi in April 2016.

Under this project, a total of 258 pregnant women were screened for β-thalassaemia syndromes and sickle cell disorders. Among these, 21 were found to be heterozygous for hemoglobin disorders (19 were sickle cell trait, 2 were β-thalassemia trait). All 21 pregnant women were counselled and advised for the blood testing of their husbands. Husbands of pregnant women came for blood testing. Among them, 4 were found to be sickle cell trait. So, a total of 4 high-risk couple were identified and counselled and followed up. All 4 high-risk couples were referred to NIIH, Mumbai for CVS and underwent CVS sampling. Among the 4 tested, 3 fetuses were found to be sickle cell trait (heterozygous) only and one was normal. The CVS sampling of high risk couples will be initiated at the NSCB Medical College, Jabalpur beginning April 2017.

Molecular procedures for prenatal diagnosis for β-thalassemias and sickle cell disease were established for the first time in Madhya Pradesh.

4.3. MORBIDITY PROFILE OF SICKLE CELL DISEASE IN CENTRAL INDIA

Principal Investigator	:	Dr. Rajiv Yadav
Status	:	Ongoing
Funding	:	Intramural

Sickle cell disease (SCD) is the homozygous condition of haemoglobin disorder that results in anemia in that particular individual and is known to inherit in Mendelian fashion. It has been reported mainly in tribal populations of central and southern parts of India. Chronic anaemia, painful crisis and bacterial infections are common in SCD children and these are responsible for early mortality. The environmental, psychological and socio-economical factors influence the clinical presentations.

The objectives of the study were to study the clinical and hematological profile of the sickle cell disease patients, and to develop strategies for management and prevention of the sickle cell disease in context to central India.

All the registered patients were referred from various OPD's of NSCB medical college, Jabalpur and various district hospitals of the state to genetics laboratory of NIRTH for the diagnosis of haemoglobinopathies. Patients those identified as sickle cell disease were registered in sickle cell clinic for detailed clinical assessment and follow up. The clinical history, clinical findings and various investigations were recorded in structural proforma and advised them to come for follow-up every three months.

52 sickle cell disease patients were registered in the Sickle cell clinic (in collaboration with Government Medical College, Jabalpur) during April 2016-March 2017 from Jabalpur and its nearby districts. About 60% were males and 40% were females. About 75% of patients were in the age group of below 15 years. Majority (53.8%) of the patients belonged to scheduled caste category (mainly Basod, Chadar, Choudhari, Dahiya, Jharia, Katiya, Mahar, Mehra and Vanshkar) and 13.5% were from tribal communities (Gond and Pradhan). About 23.1% were from OBC category (mainly Patel, Panika, Razak, Sen, Sony and Yadav) and 9.6% were from Brahmin & Rajpoot etc. About 17.3% of patients had history of multiple blood transfusions (blood transfusions of more than 2 times) and 48.1% of patients had no history of blood transfusion. About 77% of the patients had their onset of the disease before 5 years of age followed by 5-10 yrs of aged (19%). Pallor (90%), fever (90%), joint pains (85%), Icterus (85%), abdominal pain (62%) and fatigue (52%) were major sign and symptoms observed in these patients. Other sign & symptoms included bony pain (14%), chest pain (31%), joint swelling (17%) and dactylitis (8%). Splenomegaly was observed in half of the patients.

Overall, 956 SCD patients are registered in the SCD clinic up to March 2017. All the Patients and their parents were advised to avoid disease precipitating or aggravating factors like exposure to extreme climate, hard work, dehydration etc. and were also advised to seek appropriate medical intervention quickly upon any minor ailment. They were given folic acid (5 mg) to be taken daily. The anti-pyretic and anti-inflammatory drugs were also given to be taken during emergency. Up to March 2017, a total of 544 SCD patients regularly attended the clinic for follow-ups. Severity index was calculated by converting the clinical observations into numerical value in these patients. After intervention, the percentage of severe and moderate cases has been reduced and shifted to mild category. It is observed that supplementation with folic acid and quick administration of anti-pyretic/anti-inflammatory drugs along with health education to avoid disease precipitating factors has shown positive effect in decreasing the severity of the disease. A total of 115 registered SCD patients died up to March 2017 and their mean age was 14.1 ± 8.8 years.

The sickle cell clinic of the Institute is the only clinic in the MP state in which approximately one thousand sickle cell patients have been registered and followed-up regularly. After intervention, the severity of the disease has been reduced to mild category.

Division of Non-Communicable Diseases

Division of NCD is working on fluorosis and nutritional deficiency disorders, hypertension and tobacco related diseases. Division estimates fluoride in urine, water and blood routinely. We also do urine Iodine, sodium and creatinine estimation. Presently we are working in a project where we are doing estimation in water and urine for 8 states. We are also about to begin an implementation project on the protocol based management of hypertension in Madhya Pradesh in collaboration with Vital strategies, WHO country office and ministry of health in Madhya Pradesh.

Dr. T. Chakma is an epidemiologist with experience on fluorosis and non communicable diseases. He has contributed immensely to the national fluorosis control programme.

Dr. Surendra Kumar is a medical scientist and at present his research area is focused on the tobacco-related disease in tribal population especially in oral leukoplakia which is common among the tobacco user. In future, his plan is to reduce the addiction level through the NRT therapy.

Dr Suyesh Shrivastava is having seven years experience in various public health related works. His aim is to work on various Non Communicable Diseases in Tribal area

5. NON COMMUNICABLE DISEASES

5.1. HEALTH SYSTEMS PREPAREDNESS FOR INTERVENTIONS FOR DIABETES, HYPERTENSION, CHRONIC RESPIRATORY DISEASES, CARDIOVASCULAR DISEASE AND CANCERS AND DEATHS DUE TO NON-COMMUNICABLE DISEASES AMONG THE TRIBAL POPULATION IN INDIA

Principal Investigator	:	Dr S.M. Mehendale, ADG ICMR
PI at NIRTH	:	Dr. Tapas Chakma
Status	:	Ongoing
Funding	:	ICMR Task Force Project

Tribal population in India are going through the transition leading to increasing burden of non-communicable disease (NCD) risk factors that may increase the burden of NCD morbidity and mortality. Current study aims to understand the level of health systems preparedness in terms of health facility infrastructure, human resources and training to manage hypertension, diabetes, chronic respiratory disease, cardiovascular diseases and cancers. This study will also help in understanding the challenges faced by patients to seek care and the level of adherence to treatment. Study will be conducted in 12 districts (> 50% tribal) in 12 states that have districts with >50% tribal population. These include eight north eastern states, Madhya Pradesh, Himachal Pradesh, Orissa and Andamans. Survey will conducted in primary and secondary care facilities. The study will provide baseline information that will be useful to plan NCD programs. This data will be useful to measure the effectiveness of NCD interventions in future.

A community based cross sectional survey of deaths that occurred in the previous one year prior to survey in Mandla district, Madhya Pradesh was initiated in April 2017. Adults more than fifteen years of age are being surveyed. Cluster sampling method with village as the primary sampling unit was adopted and selected panchayats as clusters using probability proportional to size with linear systematic sampling from 2011 census data.

We used RGI/CGHR prospective study verbal autopsy (VA) tool for ascertaining the cause of deaths in the study. The information on deceased's socio-demographic status and other relevant information, e.g. place of death, medical history of pre existing diseases, treatment history (medication, hospitalization etc) and risk behavior (e.g. smoking, alcohol etc.) were collected. We also recorded the narrative history in local languages which included illness or events leading to the death of the individual in the chronological orders of occurrence. The complete history of sign, symptoms, events, investigations and treatment was obtained so that the medical reviewer gets sufficient information to assign a probable specific underlying cause of death.

The interim analysis of 122 deaths and the cause of death according to the International classification of disease (ICD10) showed that overall, non-communicable diseases accounted for most of the deaths (62%) followed by infectious diseases (22%) and other causes (16%) (Figure 5.1.1).

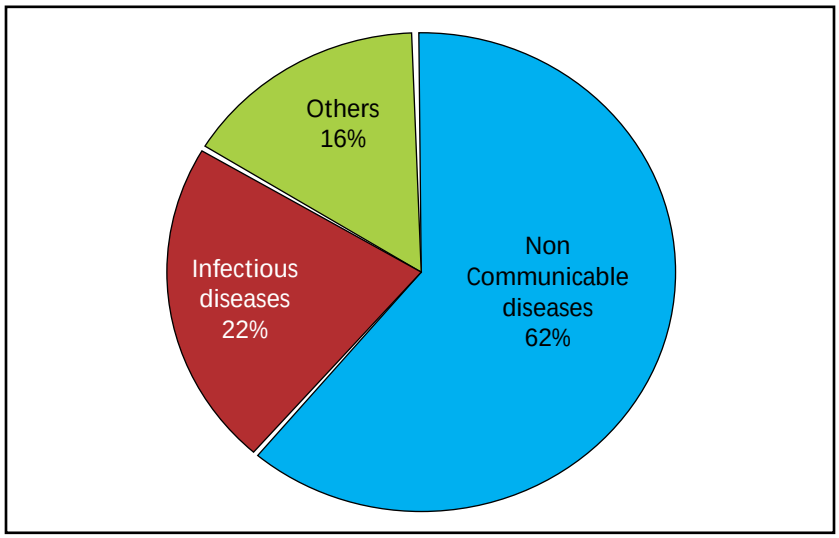


Figure 5.1.1: Cause of death according to three major categories, Mandla, Madhya Pradesh, 2017 (N=122)

Among NCD, circulatory system diseases (32%) were the leading cause of deaths followed by respiratory diseases (17.2%). Second leading cause of deaths was infectious and parasitic diseases accounted for 20.5% of deaths and neoplasm accounted for four percent of deaths. External causes accounted for 10.7% of deaths, including mainly injuries, accidents and suicides (Figure 5.1.2).

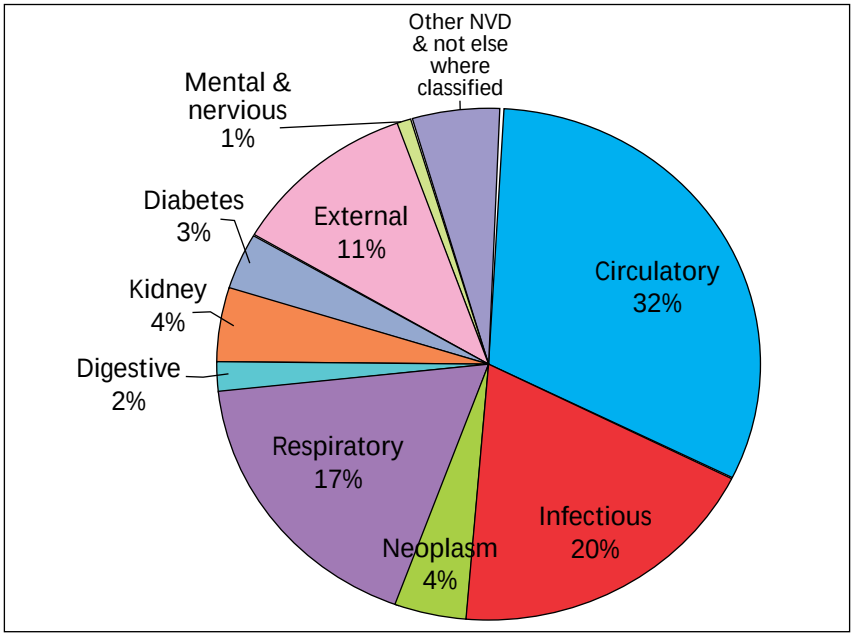


Figure 5.1.2: Overall distribution of cause of death, Mandla, Madhya Pradesh

Overall, the proportion of deaths due to NCD was higher among males (66%) as compared to females (56%) (Figure 5.1.3). The proportion of deaths due to neoplasm was higher among male (5.7%) as compared to females (1.9%). Similarly, respiratory system diseases were higher among males (14.3%) as compared to females (5.8%). Proportion of deaths due to circulatory system disease was higher among females (34.6%) as compared to males (30%). In contrast, deaths due to digestive system diseases were not seen among females. Deaths due to infectious diseases were higher among females (25%) as compared to males (17.1%). External causes including suicides were also higher in males (14.3%) as compared to females (5.8%) (Figure 5.1.3).

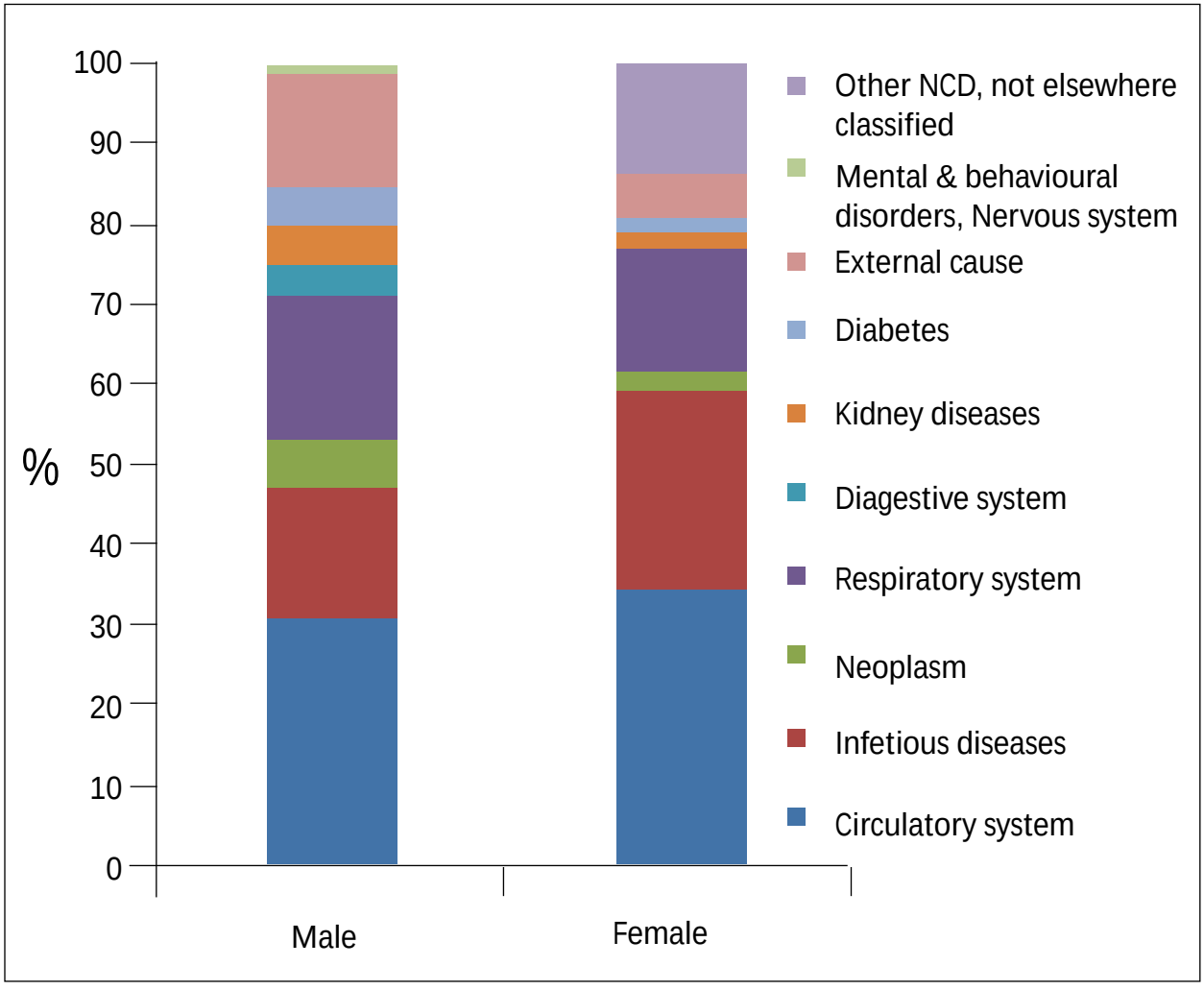


Figure 5.1.3: Cause of death according to sex distribution, Mandla, Madhya Pradesh

Non-communicable (NCD) diseases accounted for most of the deaths (62%) followed by infectious diseases (22%) and other causes (16%). Among the NCD circulatory system diseases (32%) were the leading cause of deaths followed by respiratory diseases (17.2%).

5.2. INTERVENTION PROGRAMME FOR THE MANAGEMENT OF SCABIES IN BAIGA TRIBE OF THE DINDORI DISTRICT OF MADHYA PRADESH

Principal Investigator	:	Dr. Tapas Chakma
Status	:	Ongoing
Funding	:	State Tribal Welfare Department, M.P.

Scabies is a contagious skin infection that is caused by a tiny parasite, the mite. Globally its burden has been estimated to be as high as 300 million cases per year. In developing countries, scabies is a significant public health problem because of its high prevalence and frequent complication. Children appear to be more commonly affected and are at a significant risk of streptococcal super infection, which may be complicated by acute glomerulonephrititis.

The broad objectives of the present study are to control scabies infection through regular intervention by GB lotion and Ivermectin tablet, and to create awareness about personal hygiene among Ashram school going children through IEC.

It is an intervention study and all individuals residing in 202 Baiga dominated villages are being included in the study. At present the data entry work is in progress and the data of 105 villages have been entered while data pertaining to 97 villages is still remaining. Record of 46,613 individuals has been entered and the interim analysis revealed that a total of 623 cases were found positive, thus 1.3% population was observed with scabies and among the positive cases 53.5% were males and 46.5% were females. Out of these, 623 positive cases the proportion of Baiga tribe population was 38.6% while 61.4% were from other tribe of the same area.

The main occupation of this area is largely agriculture and farming and 63.8% showed their profession as farmer. More than one third population (38.2%) are still living in Kuchcha type of house and 59.9% were living in semi puckka house with majority of them having a single room for living along with their livelihood animals too, only 41.1% were having two rooms. Open defecation is strongly prevalent and 77.6% of these were using open field and access to the toilet is restricted to only 22.4%. The primary source of drinking water was hand pump and 54.9% were utilising this facility but other were dependent on open well river or pond but at the same time source of water for bathing and cleaning is largely open well river or pond together and only 30.5% have facility of hand pump for this purpose. Illiteracy among the studied head of the house hold was considerably higher and 71.4% were illiterate, 14.4% were literate upto primary, 7.3% upto Middle and the proportion of literate beyond High School was only 6.0%.

Interim analysis of the two groups i.e. Group A (N=298) who were treated with Ivermectin and GB Lotion and Group B (N=325) treated with GB Lotion alone shows that cure rate in group A was 67.8% on 3rd day and 100.0% on 7th day; while in group B the cure rate were observed as 45.2% on 3rd day and 91.7% on 7th day. The cure rate in Group A showed significant reduction in the scabies ($p<0.0001$) as compared to group B.

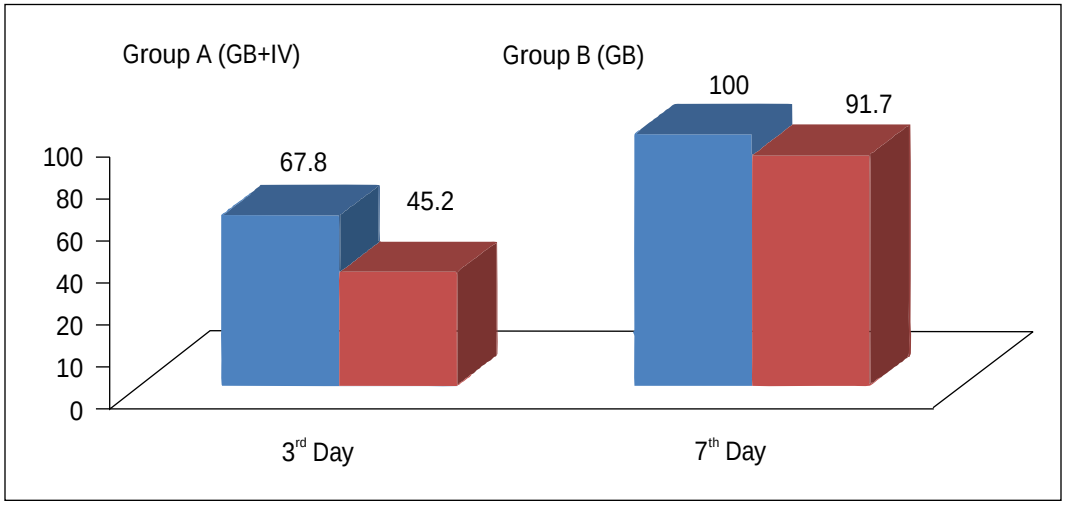


Figure 5.2.1: Distribution of scabies cure rate in Baiga Tribes of Dindori

Interim analysis shows that when treated with Ivermectin and GB Lotion, cure rate is 67.8% on 3rd day and 100.0% on 7th day and when treated with GB Lotion alone the cure rate was 45.2% on 3rd day and 91.7% on 7th day.

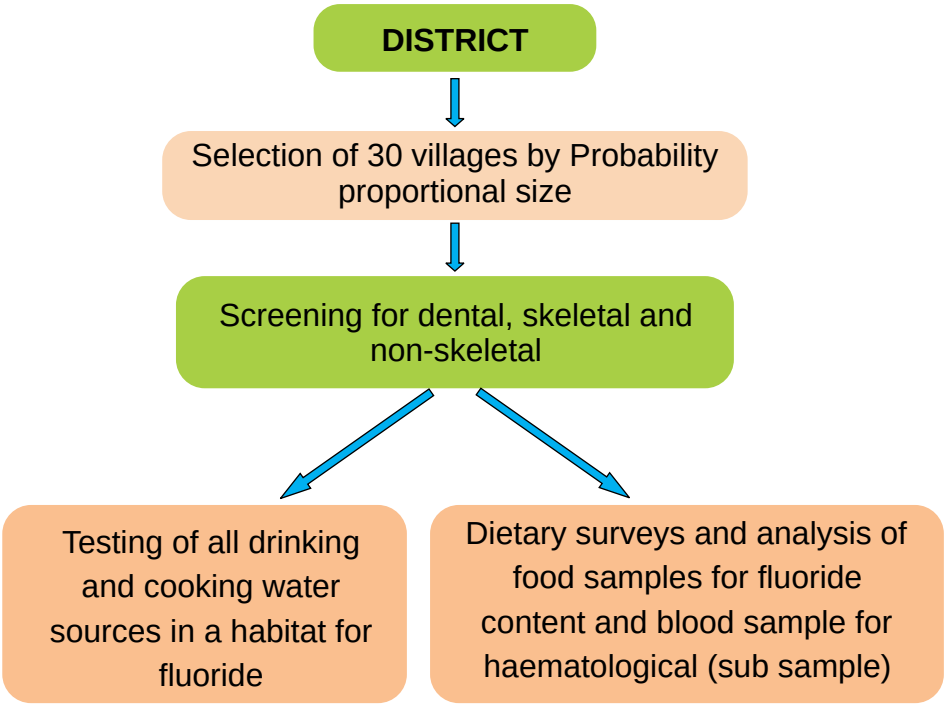
5.3. PREVALENCE OF FLUOROSIS IN THE COMMUNITY OF SELECTED DISTRICTS OF INDIA AND DEVELOPMENT OF AN APPROPRIATE INTERVENTION MODEL FOR PREVENTION AND CONTROL OF FLUOROSIS, MADHYA PRADESH

Principal Investigator	:	Dr. G.S. Toteja, DMRC, Jodhpur
PI at NIRTH	:	Dr. Tapas Chakma
Status	:	Ongoing
Funding	:	ICMR, New Delhi

Fluoride concentrations above 1.5 ppm in drinking water cause dental fluorosis and much higher concentration may cause skeletal fluorosis. The available data suggest that 15 states in India are endemic for fluorosis (fluoride level in drinking water >1.5mg/l) and about 62 million people in India suffer from dental, skeletal and non-skeletal fluorosis, out of these 6 million children were below the age of 14 years.

The primary objectives of the study are to assess the prevalence of dental, skeletal and non skeletal fluorosis in the community of selected districts in the country, to assess fluoride level in potable water and urine samples, and to develop an appropriate intervention model for prevention and control of fluorosis together with its feasibility of adoption with local stakeholders. The secondary objectives of the study are to assess the dietary intake with special emphasis on high fluoride containing food items such as black tea, black salt, lemon tea etc., to analyse the common foods for fluoride content, and to assess the nutritional status including anaemia and IDD.

The present study is a cross sectional community based study and is carried out among the 60,000 population (>6 years of age) in the selected district of MP which is Chhindwara district. The population (>6 years) is screened for dental, skeletal and non skeletal fluorosis. The study design for the study is given in flow chart. In each selected village the entire population (>6 years), approx. 2,000 are screened for dental, skeletal and non skeletal fluorosis. All sources of drinking and cooking water are being tested for fluoride concentration in the habitation. Dietary survey will be carried out for 20 households from each village.



Based on the available information of fluoride levels in the water sources of the Chhindwara district, 30 villages were selected using the PPS sampling (to cover up the minimum population of 2000 in a village the adjacent village was added, thus total number of villages are 59). A team visited all the targeted villages and collected a total of 450 water samples of the selected villages and the adjacent villages and the fluoride level of these villages are presented below Table 5.3.1.

Table 5.3.1: Fluoride level in villages

Fluoride Level (in ppm)	Group A	Group B	Group C	Total
<1.5	143 88.3%	144 81.8%	91 81.3%	378 84.0%
1.5 -3.0	15 9.3%	27 15.4%	8 7.1%	50 11.1%
>3.0	4 2.4%	5 2.8%	13 11.6%	22 4.9%
Total	162	176	112	450

Further these villages were distributed in three groups as per their fluoride levels (Source PHED) i.e. Group A, FL<1.5ppm, Group B, FL= 1.5-3.0 ppm and Group C ,FL>3.0 ppm. In group A villages samples from 162 sources were collected, in Group B 176 sources and in Group C total 112 samples were collected in the first step and tested for fluoride levels. The laboratory results showed that in Group A 88.3% samples were found with FL level <1.5ppm, 9.3% with 1.5-3.0ppm and 2.4% with FL>3.0ppm. In Group B, 81.3% samples were found with FL level <1.5ppm, 15.4% with FL=1.5-3.0ppm and 2.8% with FL>3.0ppm. Similarly in Group C, 81.3% samples were found with FL level <1.5ppm, 7.1% with FL=1.5-3.0ppm and 11.6% with FL>3.0ppm. Apart from Madhya Pradesh we also tested water samples from Andhra Pradesh, Assam, Haryana, Bihar and Rajasthan as part of multicentric study. The detailed number is presented in Table 5.3.2. Water samples from RMRCT Bhubaneswar is awaited. The study is in progress.

Table 5.3.2: Water fluoride result samples received from different participating centres

S. No.	Name of Participant Centre	Total samples tested	Positive
1.	NIRTH Jabalpur	450	118
2.	NIN Hyderabad	382	166
3.	AIIMS Patna	389	75
4.	AIIMS Jodhpur	159	122
5.	PGIMER Chandigarh	86	43
6.	RMRC Bhubaneswar	517	162
	Total	1983	686

Preliminary water analysis from Chhindwara showed that some of the ground water contains as high as 16, 18, and 20 ppm of fluoride indicating that water quality surveillance needs to be strengthened.

5.4. A THREE STEP APPROACH ABC (ASK, BRIEF ADVICE, CESSATION SUPPORT) TO HELP TRIBAL POPULATION TO QUIT TOBACCO USE AND TO MAKE THEIR HOME TOBACCO FREE

Principal Investigator	:	Dr. Surendra Kumar
Status	:	Ongoing
Funding	:	Government of Madhya Pradesh

Previous studies conducted in tribal areas of Madhya Pradesh showed a very high tobacco use, especially chewing tobacco. Our study conducted amongst the Gond tribal population of Kundam block of Jabalpur district in 2009 showed that out of 4,542 people aged six years and above screened, 2,970 (65%) consumed some form of tobacco. Both tribal males and females used some or other kind of tobacco products. Further tobacco consumption increased with increasing age of the individuals. Thus there is an urgent need for special attention and focused control measure is sought for this tribal population.

The objective of the present study is to develop a comprehensive model, combining three elements of individualised approaches for quiting tobacco use implemented within existing health and non-health services. The study is a prospective interventional case control study and has three phases. First phase is the base line study to find out the addiction rate using FTND scale and in the second phase interventions will be introduced (three steps tobacco control cessation). A three step approach ABC (Ask, Brief advice, Cessation support) will be adopted to help tribal population to quit tobacco use and to make their home tobacco free. In the third phase impact of the interventions will be assessed.

The study was initiated in the month of February 2017. The villages were selected and baseline fileld work is initiated. During the base line survey meetings with the block medical officer, head of village leader (Surpuch) gram panchayat members, aganwadi worker, ASHA worker, school teachers and village members of selected villages for their cooperation and support in the baseline survey. So far, 4 villages have been covered in the baseline survey namely Pitkuhi, Gouriya, Amera and Andha. In these villages, 205 households have been covered. The study is in progress.

Sensitization to ASHA, Anganwadi Worker and School teachers

Data collection in the field

Prevalence of tobacco use among Gond tribes is 48%, smokeless tobacco 41% and smokers 7%. However, the addiction level is low. About 8% of leukaemia cases observed among tobacco users and other health ailments also noted.

Division of Social Sciences and Ethnomedicine

Division is having four scientist's who are specialised in Demography, Anthropology and Statistics. The division is actively involved in undertaking social, demographic, behavioural, health utilisation and communication based studies on various aspects of health and diseases. Currently the studies conducted by the division are mainly focused on issues related to communicable diseases, vector borne diseases particularly on malaria and issues related to reproductive health. Many of these studies are collaborated with other ICMR institutes, State Government of Madhya Pradesh, Ministry of Tribal Affairs and also with private agencies such as Tata Trusts and Foundation for Disease Control and Elimination/ Sun Pharma.

Dr. K. B. Saha is trained in demography, anthropology and bio-ethics. His research interest is to explore the socio-behavioral aspects of health particularly of the downtrodden communities. His future plan is to empower the tribal populations by intervention of need based health communication strategy.

Dr. Dinesh Kumar research focuses on maternal and child health among the tribes in the state of M. P. His future plan is to develop research protocols on tribal habitats, lifestyles and traditional tribal medicinal system in three states (M.P, Chhattisgarh & Rajasthan).

Dr. R K Sharma is a Biostatistician/population scientist and mainly occupied in designing and monitoring & evaluation of health interventions on Malaria, Tuberculosis and Tobacco use among tribal population. He intends to improve the health of downtrodden tribal communities through identifying, analysing and highlighting their health problems and needs.

Dr. Nishant Saxena is a trained cultural anthropologist with specialisation in cognitive anthropology. He has more than 9 years of research experience of working among different tribes of India. Dr. Saxena envisages exploring issues related to ethnomedicine and translation of this knowledge into public health system.

6. SOCIAL SCIENCES AND ETHNOMEDICINE

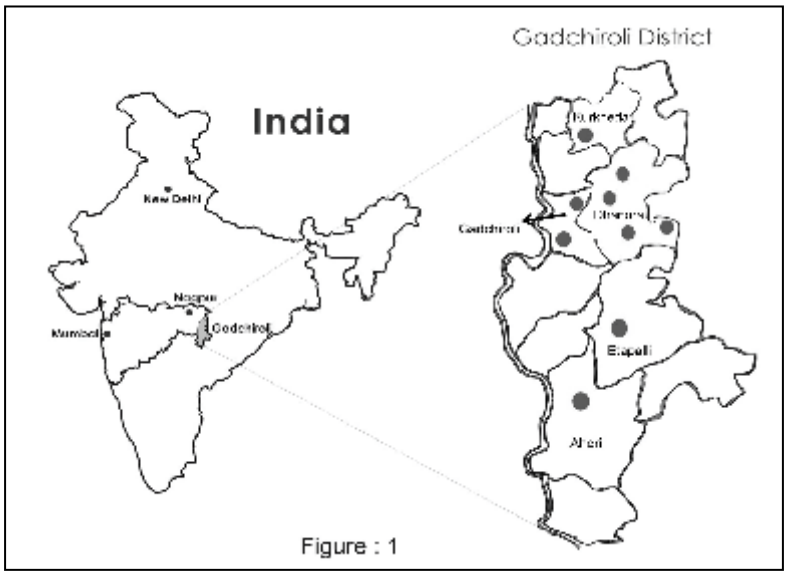
6.1. A QUALITATIVE APPROACH IN UNDERSTANDING MALARIA IN GADCHIROLI DISTRICT OF MAHARASHTRA: A JOINT INITIATION BETWEEN NIRTH & SEARCH

Principal Investigator	:	Dr. K. B. Saha Dr. Abhay Bang, SEARCH, Gadchiroli
Status	:	Completed
Funding	:	Intramural (NIRTH & SEARCH)

Gadchiroli is the most malarious district of Maharashtra contributing 46% malaria (NBVDCP, 2014) while its population is only 1% of the state (Census 2011). So it was essentially felt to design a need based malaria control strategy to cope up with the situation. In this connection NIRTH was contacted by SEARCH, Gadchiroli to design modalities of developing malaria control strategy for District Gadchiroli. NIRTH team along with the team from SEARCH visited the tribal villages and conducted qualitative survey to understand service provider's perception and common people's awareness and behaviour related to malaria and utilisation of services with first hand observation on the difficult terrains and existence of predominant vectors. Joint workshop on planning of malaria control including NIRTH, Jabalpur, DHO/ DMO, Gadchiroli and other state health authorities, Govt of Maharashtra, Tata trusts and SEARCH was organised at SEARCH, Gadchiroli during November 2016.

Planning Workshop on Malaria Control: Gadchiroli, Maharashtra

The district is categorised as undeveloped and tribal district; with 38.7% of tribals and the literacy rate of district is 66.03% (Census 2011). The major tribes those reside in the district are Gond, Madia, Pardhan and Kolam. More than 75.96 % of the geographical area is covered by forests.



Map of Study Area District: Gadchiroli, Maharashtra

Qualitative data was gathered by adopting qualitative survey techniques such as focus group discussions (FGD) in the study villages among the residents, case interviews and matrix ranking of the issues. Inclusion criteria for participation in the FGD were: 1)18 years of age, 2) willingness to give informed consent and 3) resident of the concerned village and staying there for last 5 years. The interview guideline for FGD and personal interview of the key informants were designed by the NIRTH and these were culturally validated by the SEARCH. The data was collected during 13 to 24 June 2016. Content analysis was done to prepare the report.

A total of 183 individuals took part in the study, 161 participated in focus group discussions (94 males and 67 females) and 22 provided individual interviews as key respondent. Malaria is a common health problem reported by almost 50% of the participants (Figure 6.1.1).

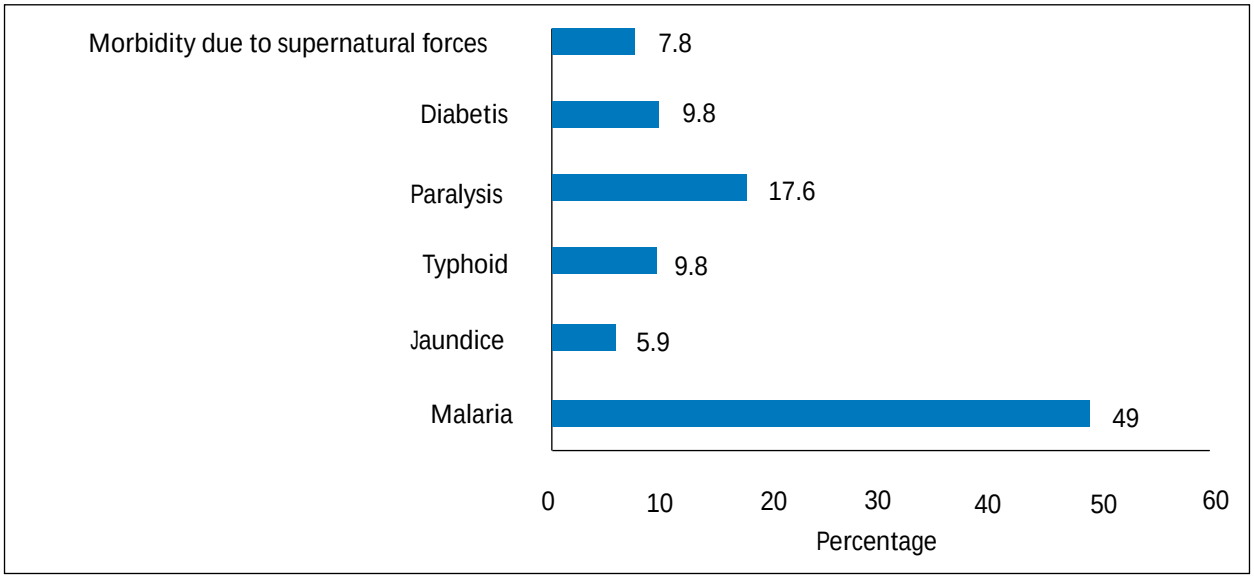


Figure 6.1.1: Matrix ranking of knowledge on commonly prevalent diseases (Village Nagri; N=51)


Matrix ranking


Focus group discussion


Personal interview with traditional healers

Field activities

Some participants were of the opinion that comparatively malaria has increased rapidly with the construction of drains in the villages. Participants stressed that it is essential to cover the village drains and clean the clogged ones on regular basis and the pits in the villages which is the source of accumulated water, needs to be filled with mud to prevent mosquito breeding.


Clogged drains


Open water storing


Innumerable potential dry pits


Perennial sources

Major breeding sources of mosquito

The qualitative survey brought to light that malaria is not unknown to them, but still people in the area were unaware of various aspects of preventive, diagnosis and treatment of the disease. The existence of misinformation adds to the gravity of the problem. There is immense faith on the traditional healers (who are the unqualified health practitioners). Further, inaccessible locations of the villages from the health posts make the residents suffer twofold.

There is a need for mass sensitisation on prevention, prompt diagnosis and treatment of malaria in the area particularly in tribal villages uniformly in all the hamlets using gram panchyat

members, unemployed youths, school children, etc. There was an upsurge to include more and more females in these awareness programmes to give a gender specific thrust to the movement. Further, there is also a need to link the sanitary workers with malaria control. Need has also been felt to sensitise ASHA and other frontline workers and trained them further on promotion of malaria prevention, diagnosis and treatment. They should be equipped with sufficient amount of anti-malaria drugs both ACT and chloroquine, etc along with rapid diagnostic kits (RDTs) to serve better. They should also work in coordination with NVBDCP workers. The procurement of the anti-malarial drugs should be done in time to meet the problem with ease. Beside clogged drains and uncovered water storage in the villages, there are innumerable dry but potential pits/ ditches in the adjacent forest areas and also paddy fields, which are the potential breeding grounds for mosquitoes during rain and post- rainy seasons. Further there are perennial water sources which remain constant source of mosquito breeding throughout the year.

Though it is difficult and challenging to destroy the vector breeding, but NVBDCP guidelines may be followed stringently by releasing larvacious fishes in these water bodies. A planned and client friendly IRS programme will increase the man vector distance. Long lasting insecticide treated bed nets (LLIN) should be distributed in the area on regular interval with proper monitoring. Looking into the greater size of the district Gadchiroli and its inaccessible locations, it's is challenging to eliminate the malaria in the region, but not impossible. The success stories of other tribal areas in particular may be replicated, tailored to meet local requirements. A concerted effort on the part of government machineries existing in the area and true community participation can make this dream comes true.

The study extracts the behavioural aspects of malaria and identifies the misconception, practices and limitations which needs correction as educational objectives of IEC strategy for control of malaria in Gadchiroli.

6.2. BASELINE SURVEY ON KNOWLEDGE, PREVALENCE AND TREATMENT SEEKING ON MALARIA IN INACCESSIBLE TRIBAL AREAS OF KALAHANDI, RAYAGADA AND KANDHAMAL DISTRICTS OF SOUTH ODISHA: A MALARIA CONTROL INTERVENTION SITE OF TATA TRUSTS AND PARTNERS

Principal Investigators	:	Dr. K. B. Saha Dr. R. K. Sharma
Status	:	Ongoing
Funding	:	Tata Trusts

Malaria is a serious public health concern in south Odisha. Tata Trusts has taken up this arduous task of controlling malaria in insurgency prone KBK region by selective need based intervention in collaboration with Odisha State Government and local partner NGOs. Trust has entrusted ICMR- NIRTH, Jabalpur to generate baseline data on knowledge, prevalence and treatment seeking on malaria. The main objective is to understand the knowledge, prevalence and treatment seeking on malaria in inaccessible tribal areas.

The study is recently initiated. Six survey schedules (Household schedule, Village schedule, Fever two weeks schedule, Fever today schedule, Death schedule and ASHA assessment schedule) are prepared and pretested at villages of Kalahandi jointly with field staff of Tata Trusts and partners. The recruitment of field staff, printing of schedules and procurement of RDTs are in progress to initiate the field work in the three districts of south Odisha.

Training of field staff for pre-testing

Interview of head of household

Testing for malaria by RDT

Difficult Terrian

6.3. ASSESSMENT OF DEMOGRAPHIC SITUATION, COMMON HEALTH PROBLEMS AND HEALTH NEEDS IN LAHUAL & SPITI DISTRICT (H.P.)

Principal Investigator	:	Dr. R.K. Sharma
Status	:	Completed
Funding	:	Intramural

The Lahual & Spiti district of Himachal Pradesh comprises two valleys:- Lahaul valley situated to the south of Ladakh and the Spiti valley -a desert mountain valley located high in the Himalaya mountains in the north-eastern part of Himachal Pradesh. Lahual and Spiti valleys are cut off from each other by the higher Kunzum Pass, at 15,059 feet height. Out of 13.8 thousand sq. km total geographical area of district, 54.8% is in Spiti valley and 45.2% is in Lahaul valley. A road connects the two divisions, but it also cut off frequently in winter and spring due to heavy snow.

Himachal Pradesh

Lahaul & Spiti District

To assess the demographic and health status of district population, the analysis of population censes, demographic health survey was carried out, whereas to assess the health problems the outdoor patient information of district hospitals was analysed. Further, to find out the recent health problems and health needs, a qualitative assessment was carried out during May - June 2016 in selected villages of Lahaul Valley.

According to 2011 census, there were total 521 villages in the district, but only 287 (55%) were inhabited. Out of 16,588 households enumerated in the district, about 60% were in Lahaul valley and rest 40% houses were in Spiti valley. Total population of district was 31,528 and out of which 19,107 and 12,457 was in Lahaul and Spiti valleys respectively (Fig. 6.3.1). Lahual and Spiti is one of tribal dominated district of Himachal Pradesh - 81.4% of district population was classified as scheduled tribes (ST) in census 2011, which comprised about 7% of state total tribal population (Fig. 6.3.1).

To assess the availability of basic amenities, health indicators and utilisation of health services in the district of the data analysis of demographic and health survey-4 (2012-13) was carried out which indicated that the most of houses in the districts had basic amenities like almost all houses had electricity, 62% had drinking water, 89% improved toilets and 37% were using clean fuel for cooking. The mean age at marriage is also relatively very high in the district, DLHS-4 shows that mean age at marriage was 25.5 years for males and 23.1 years for women. The utilisation of health services, particularly maternal and child health (MCH) services is also high in the district. Most of women during their pregnancy received at least one ANC, and more than one-third had all three ANC during their last pregnancy. Most of deliveries (79%) were institutional deliveries and mainly took places in government health facilities (67%) and rest 12% were in private health facilities (Fig. 6.3.2).

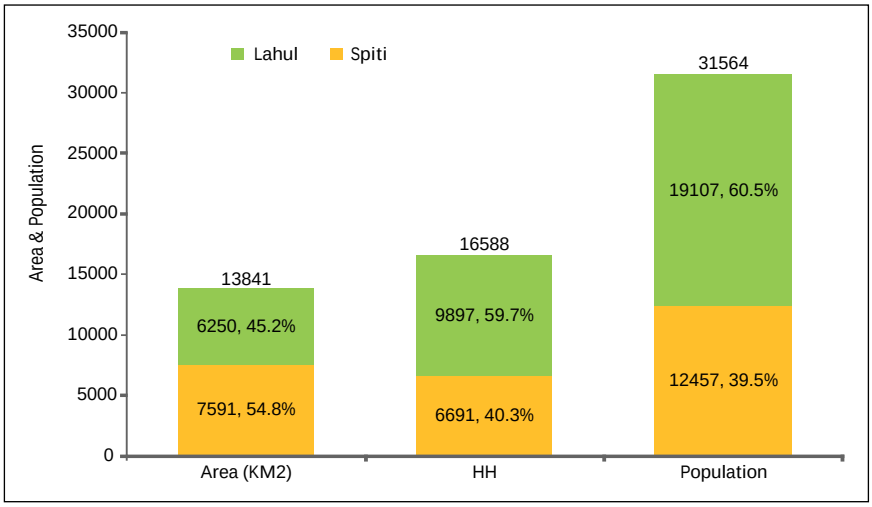


Figure 6.3.1: Geographical and population distribution in Lahaul and Spiti valleys

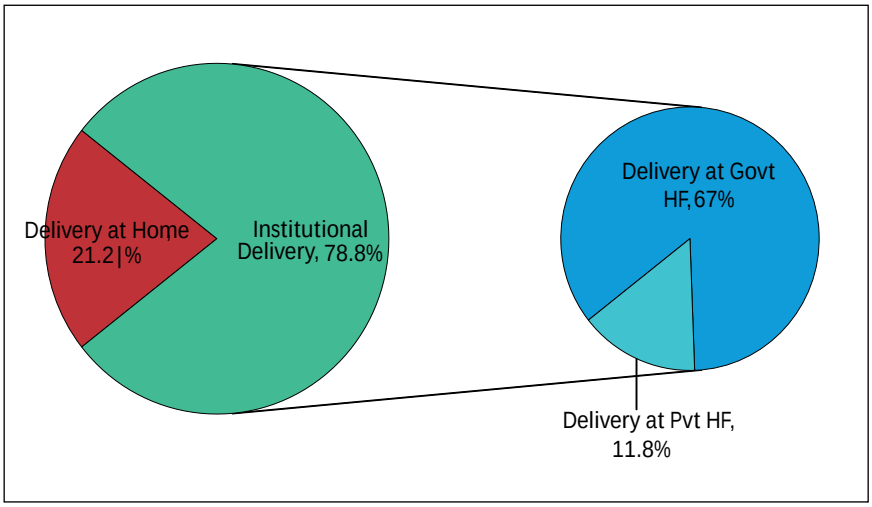


Figure 6.3.2: Proportion of institutional deliveries in the district

Survey data also showed that about 29% women (15-49 years) and 28% men (20+ years) had any kind of anaemia. Among adult population, about 16% has high blood sugar (140-160 mg/dl) and 7% has very high blood sugar (>160 mg/dl). Hypertension is also common problem, about 36% adult surveyed population had blood pressure above normal range (systolic BP>140 & Diastolic BP >90 mm/Hg).

To assess the burden of different diseases, three years (2013-15) average of OPD cases for communicable and non-communicable diseases was carried out. On average, about 54,017 cases per year of communicable diseases were recorded in the district during 2013-15. Among communicable diseases, 55% Acute Respiratory Infection (ARI), 10% Acute Diarrhoea Diseases (including gastroenteritis etc.) and 35% were 'Others' (not classified infections). But on average per year, district also had 112 cases of Pneumonia, 88 cases of Hepatitis A, 68 cases of Hepatitis B, 39

cases of Enteric fever, 29 cases of Gonococcal infections, and 15 cases of Chicken pox (Fig. 6.3.3A). In case of non-communicable diseases (Fig. 6.3.3B), district has on average 12,913 cases, out of which 8,846 cases are new cases each year. Among non-communicable cases mainly cases are of Hypertension (29%), Psychiatric disorder (32%), Accidental injuries (32%) and Lung diseases (5%).

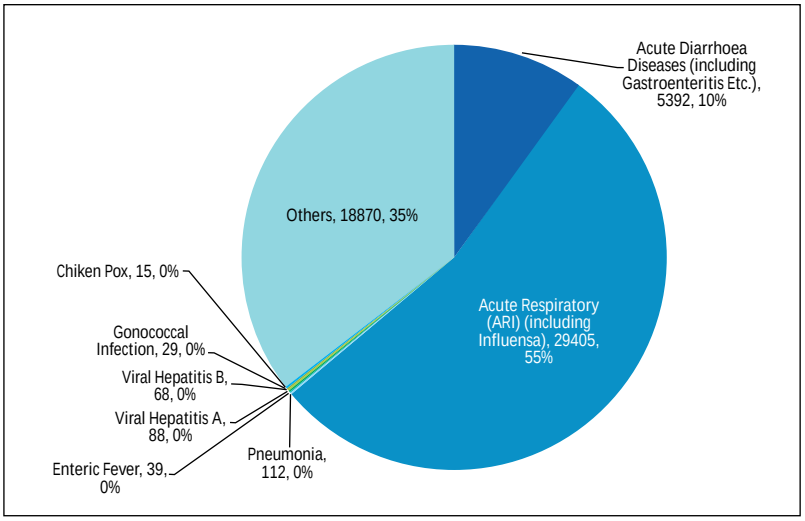


Figure 6.3.3 (A):Average per year OPD cases for Communicable Diseases in Lahul & Spiti (On average 54017 cases per year)

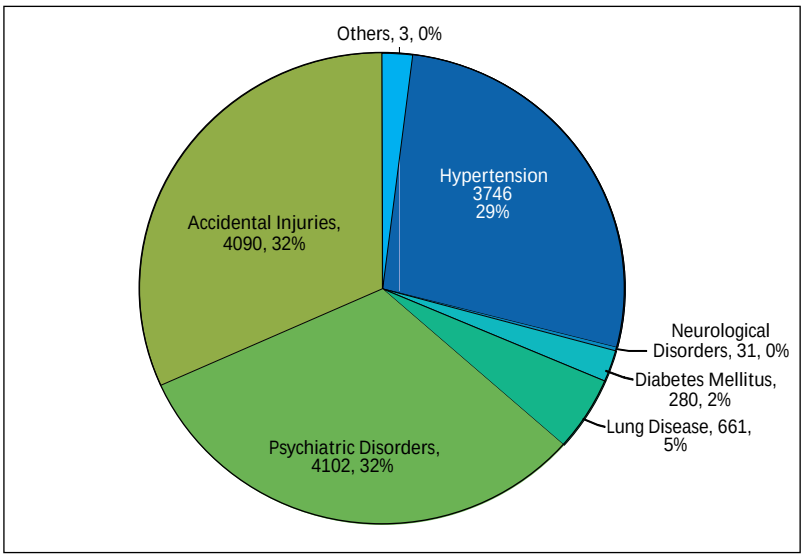


Figure 6.3.3 (B): Average per year OPD cases for Non-Communicable Diseases in Lahul & Spiti (On average Total cases=12913 and New cases=8846 per year)

The NIRTH team visited 23 randomly selected villages of Lahaul valley (Darcha, Yoche, Rarik, Chhika, Gemur, Tinno, Kawaring, Kardang, Khangsar, Gwajang, Lapchang, Prasparg, Beling, Gushal, Lot, Tholang, Rangbe, Kirting, Shansha, Phura, Jahlma, Thirot, Udaipur villages) and 8 health

facilities (CHC/PHC/Sub-centres). Overall, 8 FGD were carried out, 25 in-depth interviews including 4 Medical Officers, 8 Health workers (ANM/FHW/MHW), 13 key informants (Pradhan/Panch/AWW/ASHA/ School Teachers).

In FGDs and interview with health worker and key informant, commonly reported health problems are cough, cold, joint pain, hypertension, gastroenteritis, kidney/gallbladder stone, ARI, jaundice, diabetes, eyes infections, diarrhoea, fever, headache, stomach-ache, jaundice and TB. But in-depth interview of 4 medical officers revealed common diseases as joint pain, jaundice, scabies, typhoid, TB, kidney/gallbladder stone, hypertension, gynaecological diseases, ARI in the valley. During FGD and interviews most of participants were in option that Government of HP and research organisations can initially start working on prevention and control of diseases like hypertension, gastroenteritis, joint pain, diabetes, tuberculosis, gynaecological diseases, kidney/gallbladder stone, cancer, jaundice/viral diseases. Majority of the key informants were not happy with existing health facilities and reported that there is need for strengthening the health facilities at PHCs/CHCs level. They also reported that there is need of specialist doctors, especially a gynaecologist, radiologist and surgeon at regional hospital.

Overall the analysis revealed that socio-economic & demographic indicators are relatively better in district as compared to other tribal areas. ARI, hypertension, joint pain, gastroenteritis, stone & gynaecological diseases are the major health problems of the area. Increasing cases of hypertension, diabetes and psychological disorders are reported. Most of the health problems reported areis related to their life-style and food habits; hence a comprehensive study on food habits and life-style is required. Though the prevalence of infectious diseases is very low, but looking in and out migration in the districts because of ongoing development, the health system needs to be vigilant. There is also need for strengthening the health facilities, especially the posting of specialists at least at district hospital and CHCs.

Interview of key informant

Focus Group Discussion

Stock of woods/grass/crops residues for winter

Agriculture fields

Keylong village (District HQ)

Smoke less Chula

The qualitative assessment highlighted that most health problems in this hilly region are related to inhabitant's life-style, food habit, and geographical conditions. The incessant availabilities of qualified health personnel at CHCs/district hospital is a basic requisite for improving health services in the region.

7. TRIBAL HEALTH RESEARCH UNIT

7.1. TRIBAL HEALTH RESEARCH UNIT

The Tribal health research unit primary research objective is to improve tribal health by enhanced diagnosis of disease and efficient management of the affected patients. The secondary objective is proper documentation of the generated data to help in the overall enhancement and betterment of tribals belonging to a particular area.

During the report period (April 2016-March 2017), an electronic database on the nutrition profile of Particularly Vulnerable Tribal Groups (PVTG) has been prepared.

Tribal Health Research Unit of ICMR-NIRTH operates 24 hours malaria clinic in Jagdalpur, district headquarters of Bastar, Chhattisgarh for diagnosis and prompt treatment of the indoor patients from various departments such as Medicine, Paediatric, Gynecology and outdoor patients. Here, tribes mainly are the Gond, Halba, Dhurwa, Muria and Bison Hon Maria. This district is also under serious threat of Naxal/Maoist attack.

Suspected cases of malaria were screened by microscopy using JSB (Jaswant-Singh-Bhattacherji) staining blood smear. A total of 15,000 patients were screened for malaria, among them 804 patients were found positive for malaria with *P. falciparum* (85.7%) as major infection (Fig. 7.1). Overall, 146 severe malaria (SM) and 74 cerebral malaria (CM) cases were detected. Further, 44 deaths were recorded among the severe and cerebral malaria cases.

Collection of blood sample and patient information

Patient with Cerebral Malaria (CM)

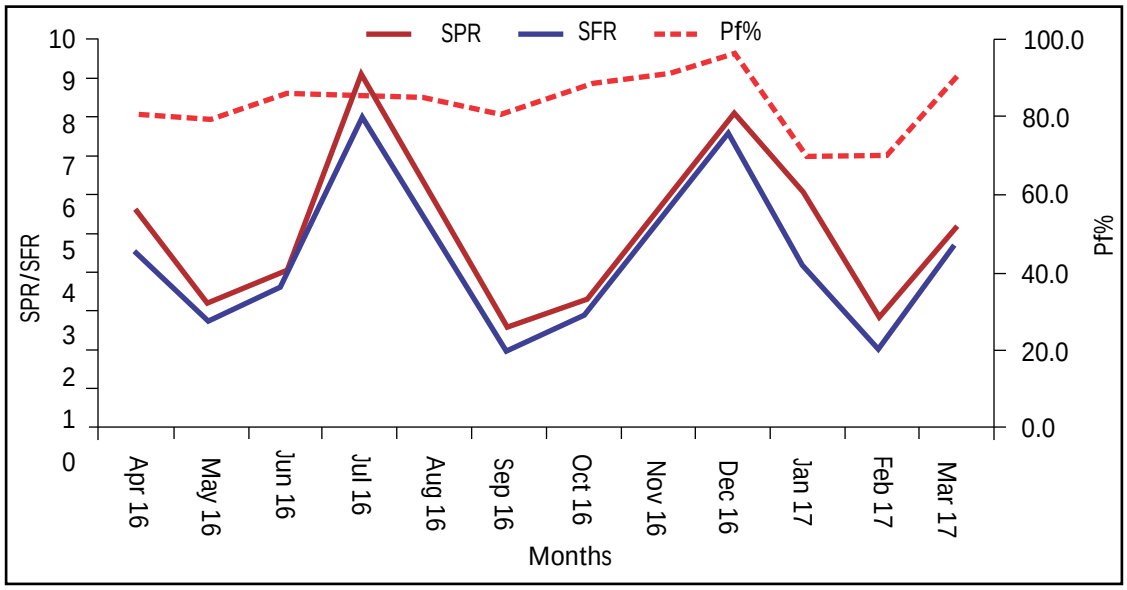


Figure 7.1: Months wise malaria positivity in Maharani Hospital Jagdalpur (April 2016 - March 2017)

Age group wise analysis revealed that children were more susceptible than adults, particularly in the >1-4 years age group SPR 10.6%, (OR 2.8; 95% CI-2.0-4.0; p<0.001).The P. falciparum infection was equally prevalent in all age groups except children of >4 - 8 years of age (Table 7.2).

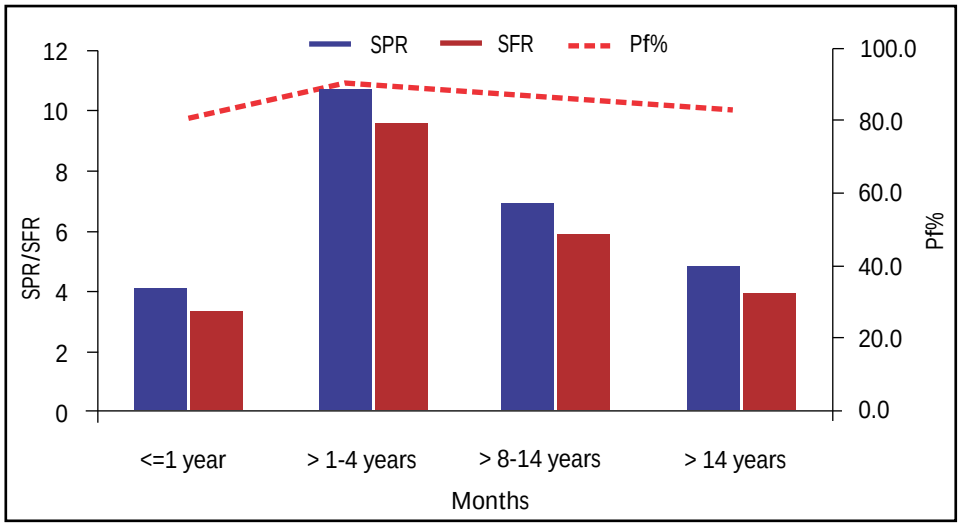


Figure 7.2: Age wise malaria positivity in Maharani Hospital Jagdalpur (April 2016 - March 2017)

The Hemoglobinopathies (especially sickle cell anemia) is highly prevalent among tribal groups and pose a major health problem. In this view, THRU also carried out study to determine the prevalence of sickle cell anaemia and other different type of haemoglobin variants using haemoglobin electrophoresis in Jagadalpur, Chhattisgarh. Overall 5,468 patients were screened for sickle cell anaemia and other haemoglobin variants; out of them 16% were found as HbAS trait and only 3.0% of patients were having HbSS disease. Further, social group wise analysis revealed that 26.6% of scheduled castes were found to be carriers of sickle cell HbAS followed by schedule tribe

patients (15.2%), OBC (13.1%) and 9.2% of general population. Whereas 5.7% of scheduled castes were found to be Sickle cell disease (SCD) patient followed by scheduled tribe (2.7%), OBC patients (2.3%) and 1.5% of general population (Fig. 7.3). Although, analysis revealed that the prevalence of HbAS genotype and HbSS genotype was statistically higher in Halba tribe patients i.e. 20.5% and 3.5% respectively followed by Gond, Muria, Madia, Bhatra and Dhurwa tribe patients (Fig. 7.4).

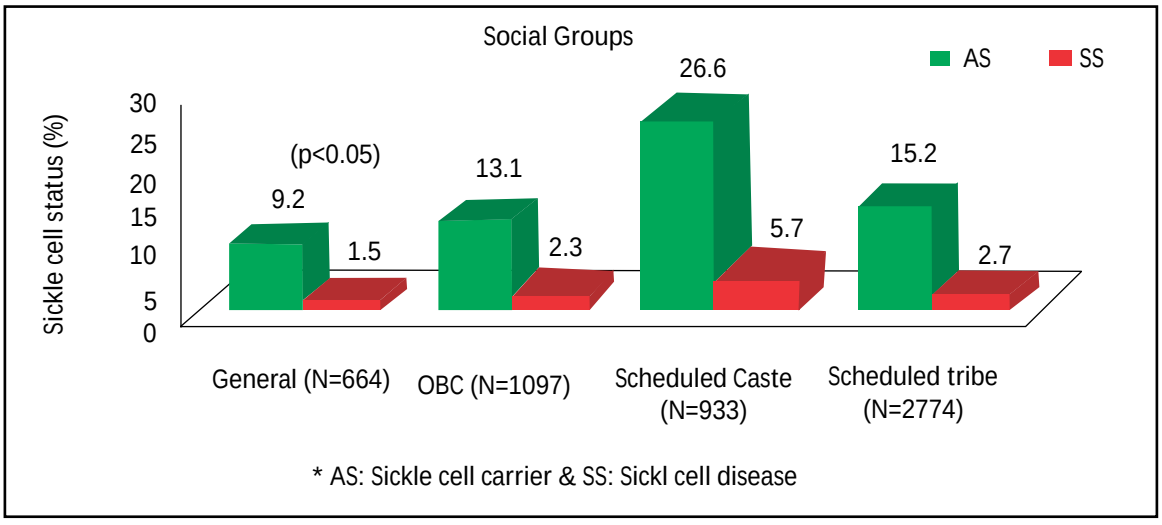


Figure 7.3: Sickle cell status among screened patients of different social group

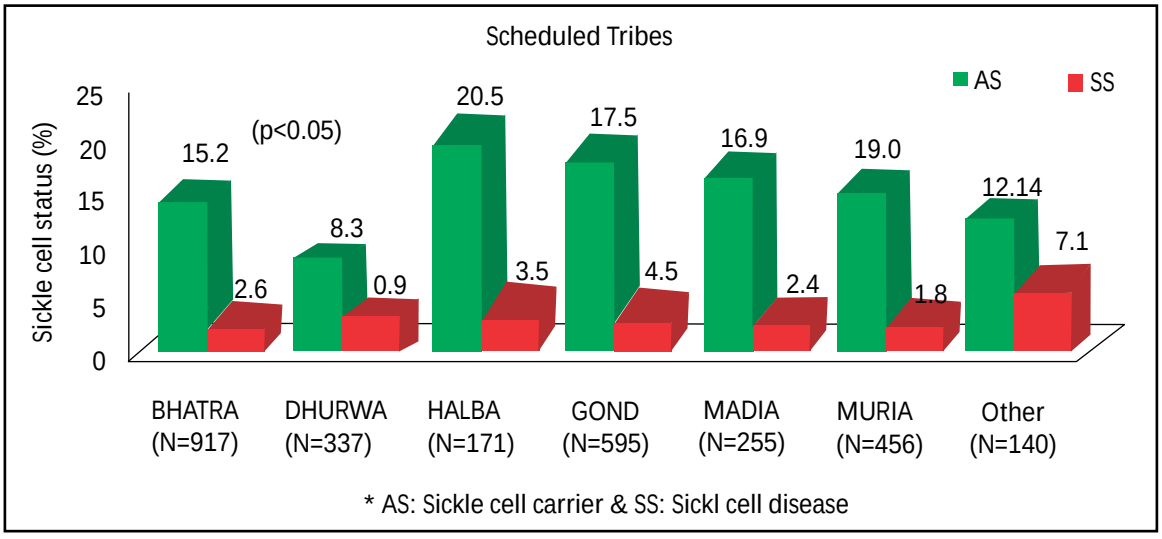


Figure 7.4: Sickle cell status among screened patient for different schedule tribes

It was found that the prevalence of sickle cell carrier and disease was significantly lower among malaria infected patients as compared to non-malaria infected patient (Fig. 7.5). Further, the value of mean parasite density in HbAS patients (8351.6±14060) compared to HbSS patients (1666.6±2167) was significantly higher ($p<0.0001$). Similarly, the mean hemoglobin level was also found higher (9.91± 2.3gm/dl) in HbAS patients as compared to HbSS patients 8.11± 2.2 gm/dl. Age-wise distribution of anaemia status among malaria positive patients showed nearly 50% patients in all age groups were moderately anaemic (Fig. 7.6).

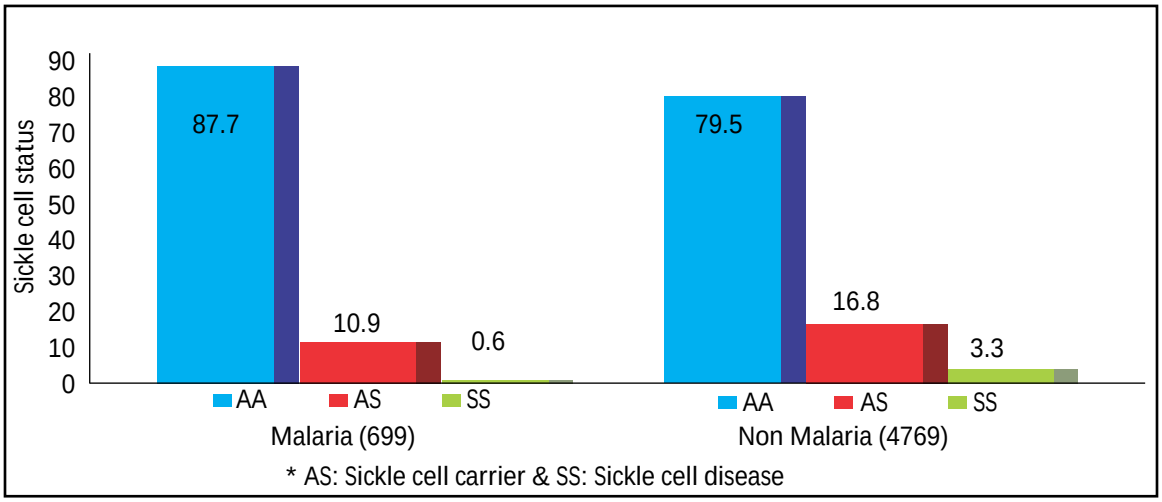


Figure 7.5: Prevalence of sickle cell among malaria and non-malaria positive patient

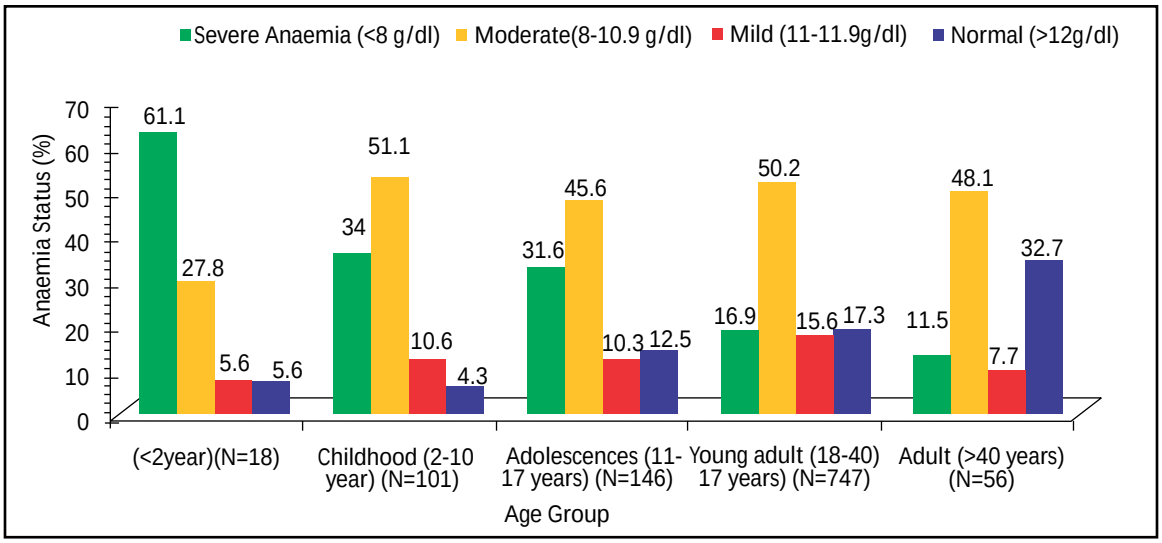


Figure 7.6: Age group wise distribution of anaemia status among Sickle cell and Malaria positive patients

The malaria and haemoglobinopathies are prevalent among tribal groups posing a major health problem. Overall, severe malaria and cerebral malaria (CM) cases including deaths due to malaria were recorded throughout the year. It was found that the prevalence of sickle cell carrier and disease was significantly lower among malaria infected patients as compared to non-malaria infected patient.

8. NIRTH-FIELD STATION KEYLONG

8.1. STUDIES ON PREVALENCE AND RISK FACTORS ASSOCIATED WITH HEPATITIS B INFECTION IN LAHAUL & SPITI DISTRICT, HIMACHAL PRADESH

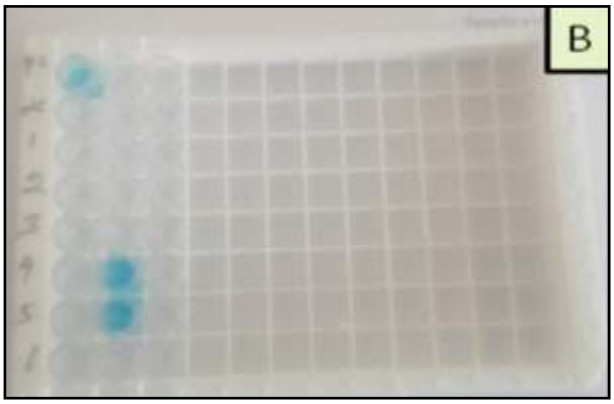
Principal Investigators	:	Dr. Pradip V. Barde Dr. R. K. Sharma
Co-Investigator	:	Mr. M. K. Shukla, NIRTH-FS, Keylong
Status	:	On going
Funding	:	Intramural

The Lahaul and Spiti district of Himachal Pradesh is situated almost 12,000 feet above sea level and has hilly terrain. It is designated as scheduled district/area by Ministry of Tribal affairs, Government of India. It has a population of 32,000 scattered over 13,833 km² area throughout the Zanskar range. The climate is generally cold and dry and in winter temperature drops up to -35°C. Very limited information available from previous reports on hepatitis and systemic survey on HBV and other viral hepatitis in the region has not been done, which makes this study important in determining the current status of actual HBV prevalence. The analysis of risk factors in the study will make it effective in designing the prevention and control strategy. The identification of circulating genotype is necessary as genotype D is prevalent in India and related to chronic hepatitis B (CHB). The study also aims to estimate prevalence of hepatitis C.

This is a cross sectional field based study. The estimated minimum sample size is 1300 individuals. The project is implemented by NIRTH, Jabalpur through its field station at Keylong. 2ml intravenous blood is taken from each participant following medical and ethical guidelines. All the samples are tested for Hepatitis B surface antigen (HBsAg) and antibodies for HCV (total antibody) by ELISAs at Keylong. Further the HBsAg reactive samples are tested for anti HBsAg antibody, anti HBeAg and anti HBcAg antibody. Representative positive samples are also subjected to molecular analysis to identify the genotype/s of HBV viruses. The information on demographic, clinical details and risk factors are also collected through a well-designed, pre tested interview schedule.

The study was initiated in January, 2017 during peak winter season, heavy snowfall and temperature around -35°C with oxygen depleting environment. So, till March 2017, we could manage to collect 211 samples from Keylong and Sissu (Lahaul Valley) (Table 8.1.1). Out of 211 samples, 10 samples are found positive for HBsAg of which five were each male and five female. Only one sample found reactive in HCV IgM ELISA.

(A)-Sample collection



(B)-HBsAg ELISA test plate with reactive samples

Table 8.1.1: Participants age group distribution in the study.

Age Group (in yrs.)	Males		Females		Total	
	Tested	Positive	Tested	Positive	Tested	Positive
⩽5	00	00	00	00	00	00
6-25	13	00	12	02	25	02
26-60	73	04	88	03	161	07
⩾61	14	01	11	00	25	01
Total	100	05	111	05	211	10

This is first cross-sectional study in the high altitude area of the country and it will provide its prevalence and associated risk factors of HBV in Lahaul and Spiti.

8.2. G6PD DEFICIENCY, SICKLE CELL ANAEMIA AND OTHER ABNORMAL VARIANTS OF HAEMOGLOBIN IN LAHAUL & SPITI

Principal Investigator	:	Dr. S. Rajasubramaniam
Status	:	Ongoing
Funding	:	Intramural

This project mainly emphasised on screening of individuals for sickle cell anaemia (SCA), a genetic disorder and is reported among different tribes of India. As Lahaul & Spiti, Kinnaur and Chamba (Bharmour) are the three tribal districts of Himachal Pradesh, study was initiated to check whether the sickle cell disease is present among tribes residing in these districts or at high altitude of 10,000 - 12,000 ft above sea level.

The survey was conducted in Pattan valley, Todh valley and Tinnen valley (sub-valleys of Lahaul). A total of 492 samples were collected from the date of initiation till March, 2017.The blood samples were collected from patients after obtaining informed consent. The samples were subjected to CBC analyser to count Hb %, MCV, MCH values and other parameters. Further for identification of SCA, solubility test was done for preliminary screening of SCD patient and Hb electrophoresis was done to know the normal haemoglobin pattern. Same samples were subjected to G6PD deficiency test to screen patients with deficient glucose-6- phosphate dehydrogenase enzyme.

Out of the 492 samples processed for Sickle cell anaemia, none were found to be positive for hemoglobin abnormality in this region.

Collection of Blood sample and Individual information at Field Station Keylong and Door to Door surveys

8.3. A PILOT STUDY ON REPORTED REPRODUCTIVE TRACT INFECTION (RTI) AMONG WOMEN AT KEYLONG, H.P.

Principal Investigators	:	Dr. K. B. Saha Mrs. Bandhu Parihar, NIRTH-FS, Keylong
Status	:	Ongoing
Funding	:	Intramural

Due to extreme cold climate and scarcity of water, the personal hygiene is not properly maintained in tribal areas of the region. This situation may promote reproductive tract infections (RTI) among the local people. This is an exploratory study to understand the behavioural aspects related to personal hygiene practices and the gravity of RTI problems in this region, so that more in-depth scientific study may be undertaken in future on RTIs. The main objective of the study is to understand the knowledge; self reported symptoms and treatment seeking for RTIs among women in reproductive age group in and around Keylong. The survey schedules are designed and pre-tested and actual field work will be initiated soon.

9. REGULAR ACTIVITIES

9.1. INTERMEDIATE REFERENCE LABORATORY (TUBERCULOSIS)

Institute has an Intermediate Reference Laboratory for TB which supports RNTCP for diagnosis and follow-up of TB & MDR TB. Prompt diagnosis is provided by Gene Xpert. This year, total of 2,859 specimens were tested by Gene Xpert. *M.tuberculosis* was detected in 1,322 and 167 (12.6 %) specimens were resistant to rifmapicin. 943 extra pulmonary specimens were tested of which 273 were positive for *M.tuberculosis* while 41/273 (15.0%) were resistant to rifampicin. Laboratory also processed 1,753 samples from follow up cases for culture.

9.2. STATE REFERENCE LABORATORY (HIV & ICTC)

Total of 62 ICTC's and 27 blood banks are linked to the State Reference Laboratory (HIV) for External Quality Assurance. This year a total of 1,561 specimens were tested under the scheme. The laboratory is pursuing discordant samples and takes action on it. This activity is under National AIDS Control Program. In the ICTC, 1,001 individuals were tested for HIV. Out of them, 17.4% of males and 13.7% females were positive for HIV.

The laboratory is also testing site for HIV Sentinel Surveillance Program of NACO. This year the HIV sentinel surveillance program was carried out during January to March 2017. The laboratory was linked to 20 ANC sites. Total of 8,000 ANCs samples were tested, out of which 14 were positive for HIV.

9.3. HUMAN RESOURCE DEVELOPMENTS

Number of student's enrolled/awarded for Ph.D. work.

Guide	No. of Scholars		University
	Enrolled	Submitted	
Dr. Neeru Singh	4	1	Rani Durgawati Vishwavidyalaya, Jabalpur
Dr. Neeru Singh	1		Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal
Dr. Neeru Singh	1		Symbiosis University, Pune
Dr. K.B. Saha	2	1	Rani Durgawati Vishwavidyalaya, Jabalpur
Dr. P. V. Barde		2	Rani Durgawati Vishwavidyalaya, Jabalpur
Dr. S. Rajasubramaniam		1	Andhra University, Vishakhapatnam

9.4. LIBRARY

The library at the institute continues to cater the documentation and information needs of the scientists, staff and students of the center as well as other institute like NSCB Medical College, Veterinary College, Home Science College, Rani Durgawati Vishwavidyalaya, etc. It also extends services to research personnel from other Universities/Institutes.

Library is equipped with modern furniture, air-conditioners, compactors and display racks for display of latest arrivals, i.e. books and periodicals for its readers. The objective of this e-resource is to provide/retrieve full text of online articles and conduct specific searches relevant to the user from multiple publishers. Alert messages regarding new developments and recent arrivals in library are provided through e-mails from time to time. Photocopies of available literature are provided for research use.

The library has the following resources:

New additions	
Journals subscribed Periodicals	32
1. International Periodicals	21
2. Indian Periodicals	11
Books	1,425
WHO Publications	813
Bound Foreign Journals	1,480
Bound Indian Journals	863
MEDLINE CDs	21
Census + Other CDs	07
Census Floppies	60
CDs on Other Subjects	120
Total Library Collection	4,825
Member of Following Consortia-	

Beside above facilities, Library also provides information regarding various links as below for open access journals to its user.

Providers	No. of E-Journals/Access links
ICMR e-Consortia	
Science	http://science.sciencemag.org/
NEJM	http://content.nejm.org/
Lancet	http://www.sciencedirect.com/
NATURE	http://www.nature.com/
JGATEPLUS (Open access)	24,084 Journals& http://jgateplus.com/search/

Directory of other Open Access Journals	No. of Journals
http://www.doaj.org/doaj?func=home&uiLanguage=en	10,486 journals searchable at article & 2,72,5680 articles listed
BioMed Central's Open Access Journals http://www.biomedcentral.com/content	1,053 total open access journals listed & 3,28,031 articles listed
Free Medical Journals http://www.freemedicaljournals.com/index.htm	5,088 Journals
Bentham Science Publishers http://www.benthamscience.com/open/a-z.htm#A	3,30Journals

Library Reading Room

9.5. NIRTH PUBLICATIONS

Institute publishes a biannual and bi-lingual Tribal Health Bulletin, a peer reviewed UGC approved journal on tribal health and four-monthly newsletter NIRTH Update.

9.6. REVIEW OF MANUSCRIPT FOR SCIENTIFIC JOURNAL

The scientists of this Institute are members of review board of various international and national peer reviewed journals, viz. Lancet, The Lancet Global Health, WHO Bulletin, Malaria Journal, Plos One, Journal of Parasitology, Journal of Infectious Diseases, Climacteric, Indian Journal of Medical Research, Current Science, Rural and Remote Health etc.

10. PUBLICATION OF RESEARCH PAPERS

1. Ahmad A, Bharti PK, Singh N. (2016). Review: Importance of Rapid Diagnostic Test in Disease Endemic Areas. *Tribal Health Bulletin*. 23(2):18-23.
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3. Barde PV, Sahu M, Shukla MK, Bharti PK, Sharma RK, et al. (2017). High-Frequency of Non-Aspartic Acid Residues at D222 Position in the Hemagglutinin Gene of Influenza A (H1N1) pdm09 in Fatal Cases in Central India during Upsurge of 2015. *Epidemiol Infect.* Oct;145(13):2656-2665. (IF: 2.515).
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6. Bharti PK, Shukla MM, Ringwald P, Krishna S, Singh PP, Yadav A, Mishra S, Gahlot U, Malaiya JP, Kumar A, Prasad S, Baghel P, Singh M, Vadadi J, Singh MP, Bustos MD, Ortega LI, Christophel EM, Kashyotia SS, Sonal GS, Singh N. (2016).Therapeutic efficacy of artemether-lumefantrine for the treatment of uncomplicated *Plasmodium falciparum* malaria from three highly malarious states in India. *Malar J.* 13; 15(1):498. (IF: 3.10).
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11. Chaturvedi N, Bharti PK, Tiwari A, Singh N. (2016). Strategies & recent development of transmission-blocking vaccines against Plasmodium falciparum. *Indian J Med Res*.143 (6):696-711. (IF: 1.53).
12. Devendra R, Rajasubramaniam S, Singh MPSS, Vishwakarma CP, Godbhole S, Singh N, Gupta V, Kedar P, Mukherjee MB. (2017). Identification of a novel S184F mutation causing glucose-

6-phosphate-dehydrogenase deficiency in a tribal family of Madhya Pradesh, Central India. *Meta Gene*. 130–133. (IF: 0.7).

13. Ghosh S, Gupta S, Kumar KA, Sharma AK, Kumar S, Nagar G, Kumar R, Paul S, Fular A, Chigure G, Nandi A, Manjunathachar HV. (2017). Characterization and establishment of a reference deltamethrin and cypermethrin res*istant tick line (IVRI-IV*) of *Rhipicephalus (Boophilus) microplus*. *Pestic Biochem Physiol*. DOI: 10.1016/j.pestbp.2017.03.002. (IF: 2.59).
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15. Kareemi TI, Bharti PK, Singh N. (2016). Challenges for Malaria Control in Tribal Areas of India. *Tribal Health Bulletin*. 23(2):1-6.
16. Krishna S, Bharti PK, Singh N. (2016). Short Review: Blood Group Genotyping and its Relation with Severe *P.falciparum* Malaria. *Tribal Health Bulletin*. 23(2): 14-17.
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38. Verma A, Saha KB. (2016). Infant mortality among the Scheduled Tribes in Central India: A concern. *Indian Pediatr.* 53: 1117. (IF: 1.152).

11. CONFERENCE/WORKSHOP/MEETING/SYMPOSIUM/AWARDS

11.1. CONFERENCE, WORKSHOP, MEETING, SYMPOSIUM ATTENDED

Dr. Neeru Singh

- Attended meeting on Prevention and Treatment of Malaria during pregnancy at Maternal Health division, ICMR, New Delhi on 5th May, 2016.
- Attended 1st meeting of the Executive Committee for Sickle cell Anemia on 20th May, 2016 at Ministry of Science & Technology, Government of India.
- Attended the workshop on "How to Control Malaria at Gadchiroli" organized jointly by SEARCH, NIRTH, Jabalpur, State Govt. of Maharashtra and Tata Trusts on 28th& 29th November, 2016 at Gadchiroli, Maharashtra.
- Attended Eleventh Malaria Elimination Group Meeting (MEG XI) during 6th-9th December, Chennai, India.
- Participated in 13th conference on vectors and vector borne diseases at Central University of Tamil Nadu during 27th February -1st March, 2017 at Hotel Crown Plaza, Chennai.

Attended "A problem formulation workshop on gene drive technologies for mosquito vectors" which was held in between 24th - 28th May, 2016 Washington, USA.

Attended the 'Technical consultation on *P. falciparum* hrp2/3 gene deletions' which was conducted by WHO/Global Malaria Programme (GMP), which was held on 7th & 8th July, 2016 Geneva, Switzerland.

Attended "Second Bi-regional meeting of Asia-Pacific Malaria Drug Resistance Monitoring Networks", which was held between 24th – 26th October, 2016 at Bangkok, Thailand.

Attended WHO Regional consultation meeting on accelerating progress toward ending HIV/TB/Malaria in SEARO at Dhaka, Bangladesh between 28th -30th March, 2017.

Dr. V. G. Rao

- Attended ICMR-WHO workshop for the 'Development of TB Prevalence Survey protocol' during 10th-12th May, 2016 at Hotel Taj Palace, Diplomatic Enclave, New Delhi.
- Attended DST-ICMR Workshop on "Climate Change Impact on Human Health", on 25th & 26th July, 2016, New Delhi.
- Participated in India-Africa Health Sciences Meet organized by the Indian Council of Medical Research (ICMR) and the Ministry of External Affairs, Government of India during 1st-3rd September, 2016 at Vigyan Bhavan, New Delhi.
- Attended workshop for development of National Strategic Plan for Tuberculosis control in India (2017-2023) in the context of Sustainable Development Goals for India. Organized by the Central TB Division, Govt. of India and World Health Organization on 18th &19th October, 2016 at New Delhi.
- Participated in 71st National Conference of Tuberculosis and Chest Diseases (NATCON 2016) at PGIMER Chandigarh during 16th - 18th December, 2016 and chaired the session.

Dr. Tapas Chakma

- Attended meeting of the concurrent assessments of private sector engagement intervention for Tuberculosis during 16th -21st May, 2016 at Mumbai.
- Evaluated the NHM programme of Gujarat as part of the 10th CRM team during 5th -11th November, 2016.
- Attended meeting of the medico friendly circle on NCD at Chhattisgarh during 26th - 28th January, 2017 organized by JSS, Ganiyari.

- Attended meeting of ICMR Task force on fluorosis on 3rd February, 2017 held at ICMR New Delhi.
- Attended capacity building workshop for the ICMR scientists during 6th-11th February, 2017 organized by ASCI, Hyderabad.
- Attended project review meeting of the MDRU of SS medical college Rewa, MP, on 14th February, 2017.
- Attended project review meeting of the MDRU of Pt. JNM medical college Raipur, Chhattisgarh, on 20th & 21st March 2017.

Dr. Gyan Chand

- Attended Brainstorming meeting on future scopes and challenges on Research in medical entomology held on 26th & 27th October, 2016, India.
- Attended workshop on "How to Control Malaria at Gadchiroli" organized jointly by SEARCH, NIRTH, Jabalpur, State Govt. of Maharashtra and Tata Trusts on 28th & 29th November, 2016 at Gadchiroli, Maharashtra.
- Participated in Five day training workshop on Entomological surveillance of ZIKA virus at Vector control Research Centre (ICMR) Puducherry during 6th -10th February, 2017.
- Attended 13th Conference on Vectors and Vector Borne Disease during 27th February -1st March, 2017 at Chennai.

Dr. K. B. Saha

- Dr. Saha presented the findings of the qualitative KABP survey on malaria at workshop on "How to Control Malaria at Gadchiroli" organized jointly by SEARCH, NIRTH, Jabalpur, State Govt. of Maharashtra and Tata Trusts on 28th & 29th November, 2016 at Gadchiroli, Maharashtra.
- Delivered lectures on research methodology to the Ph.D scholars of Department of Economics, Rani Durgawati Vishwavidyalaya, Jabalpur on 26th December, 2016.
- Attended, presented a paper and also chaired a session at the National Seminar on Holistic Anthropological Approach for Tribal Health: Perception & realizations, on 2nd & 3rd February, 2017 at Dept. of Anthropology, Dr. H.S. Gour Vishwavidyalaya, Sagar, MP.

Dr. Saha chairing a scientific session at National Seminar on Tribal Health at Dept. of Anthropology, Dr. H.S. Gour Vishwavidyalaya, Sagar

Dr. Jyothi Bhat

- Participated in 1st workshop for India Health fund organized by Tata Trusts on 15th & 16th November, 2016 at Mumbai.
- Attended meeting on 'Evidence for Cholera in India" on 22nd November, 2016 at THSTI, Faridabad.
- Presented a paper 'Efficacy of Gene XPert MTB/RIF in detection of tuberculosis in children; an experience from Central India' in 71st National Conference of Tuberculosis and Chest Diseases held during 16th-18th December, 2016 at PIMIER, Chandigarh.
- Participated in HIV Sentinel Surveillance Training of Trainers during 3rd -7th January, 2017 at NARI Pune.

Dr. P.V. Barde

- Attended training on Epi-Info software at ICMR-NIV Pune during 7th -11th January 2017.
- Attended annual review meet on VHF at Jaipur on 9th & 10th March 2017.

Dr. R.K. Sharma

- Attended a capacity building workshop at ICMR HQ, Delhi during 1st–3rd September, 2016.
- Attended a capacity building workshop on State Level Disease Burden Estimates during 6th – 9th September, 2016 at PHFI, Gurgaon, Haryana.
- Participated in a Burden of Diseases (BOD) Seminar held on 28th November, 2016 at National Institute for Medial Statistics (ICMR), Delhi.
- Attended the workshop on "How to Control Malaria at Gadchiroli" organized jointly by SEARCH, NIRTH, Jabalpur, State Govt. of Maharashtra and Tata Trusts on 28th & 29th November, 2016 at Gadchiroli, Maharashtra.
- Presented a paper "Common Health morbidities among tribes of India", in 40th Indian Social Science Congress, at University of Mysore during 19th-23rd December 2016.
- Presented a paper "Major Health Problem of Tribes of India" and co-chaired a session in the National Seminar on Holistic Anthropological Approach for Tribal Health, held on 2nd & 3rd February, 2017 at Dept. of Anthropology, Dr. Harisingh Gour Vishwavidyalaya, Sagar, MP.
- Attended "The Global Burden of Disease (GBD) Technical Training Workshop 2016" at Island of Evia, Greece between 3rd-14th May, 2016.

Dr. Rajiv Yadav

- Attended and chaired a session at 71st National Conference of Tuberculosis and Chest Diseases (NATCON 2016) at PGIMER Chandigarh during 16th- 18th December 2016.

Dr. Manjunathachar HV

- Participated in XXVI National congress of veterinary parasitology and Inter-National symposium at Shimogga veterinary college, Karnataka, India during 15th -17th February, 2017.

Staff members/ Project staff/ Research Scholars

- Mr. Pramod Kumar and Mr. R.K. Thakur attended Account and administration training and meeting at Pune on 25th May, 2016.
- Mr. Piyush Joshi and Mr. Rameshwar Khedekar attended training on Trioplex qRT-PCR at ICMR- NIV Pune during 1st-10th September, 2016.
- Mr. Piyush Joshi presented a paper in 13th Conference on Vector and Vector borne diseases during 27th February – 1st March, 2017.

11.2. AWARDS/ RECOGNITIONS/ MEMBERS OF DISTINGUISHED BODIES

Dr. Neeru Singh

Recipient of Vestergaard Frandsen Award for exceptional work in the field of vector bionomics and resistance at 13th Conference on Vectors & Vector Borne Diseases (CVVBD 2017) jointly organized by the National Academy of Vector Borne Diseases (NAVBD) and the Central University of Tamil Nadu (CUTN) at Chennai on 27th February, 2017.

Dr. S. Rajasubramaniam

Dr. S. Rajasuramaniam was felicitated by the Prof. G. Nageswara Rao, Vice Chancellor, Andhra University, Vishakhapatnam on 13th March, 2017.

Dr. Manjunathachar HV

Receiving J. P. Dubey Young Scientist Award: IAAVP-2017 at Shimogga veterinary college, Karnataka during 15th - 17th February, 2017.

11.3. NIRTH ORGANISED CONFERENCE, MEETING, SYMPOSIUM, WORKSHOP, TRAININGS

Conducted 6th Regional workshop on capacity building of the faculty/researchers in the MRU Medical College during 16th -18th May, 2016.

Conducted workshop on formulation of Ethical guidelines for Biomedical Research among Tribals, on 21st & 22nd May, 2016 at NIRTH, Jabalpur. All scientists of the institute participated in the workshop.

Conducted workshop on "Malariology for malaria technical supervisor" held during 7th - 13th June, 2016.

Organised Pre Congress Session of National Seminar on Tribal Health and Quality of Life: 40th Indian Social Science Congress on 1st November, 2016 at NIRTH, Jabalpur.

Organised 6th Annual Meeting of Tribal Health Research Forum held on 2nd November, 2016.

Conducted workshop on "How to Control Malaria at Gadchiroli" with SEARCH, State Govt. of Maharashtra and Tata Trusts on 28th & 29th November, 2016 at Gadchiroli, Maharashtra.

Organised a National Seminar on Tribal Health and Quality of Life in the 40th Indian Social Science Congress with Indian Academy of Social Sciences and Mysore University at Mysore during 19th- 23rd December, 2016. (Dr. K B Saha- Convener)

The Research Advisory Committee conducted meeting with Model Rural Health Research Unit (MRHRU), Badoni, Datia, Madhya Pradesh on 10th & 11th January, 2017 at Datia.

Zonal Training was organised on HIV sentinel Surveillance-2017 for medical officers, counselors and technicians of the ANC sites on 25th & 26th January, 2017 at NIRTH, Jabalpur.

29th Scientific Advisory Committee (SAC) meeting of NIRTH, Jabalpur was held on 31st January & 01st February, 2017.

The SAC committee visited the upcoming Central Animal Facility, Laboratories and evaluated the scientific posters presented by the students and research scholars of the institute on 1st February, 2017.

Malaria Elimination Demonstration Project under Public-Private-Partnership was held on 16th February, 2017 at Office of the Regional Joint Director, Health Services.

The National Seminar on "Tribal Health, Education and Livelihood (HEAL)" was jointly organised with Royal Tribal Forum, India on 18th & 19th February, 2017.

Conducted Malaria Elimination Advisory Group (MEAG) meeting for Malaria Elimination Demonstration Project (M-MEDP) on 6th - 8th March, 2017 at NIRTH, Jabalpur.

Organised a seminar on use of Luminex Multi Disease Surveillance by Dr. Venkatachalam Udhayakumar, Center for Global Health, CDC, Atlanta, GA, USA at NIRTH, Jabalpur on 18th August, 2016.

Conducted a meeting with National Health Mission team, MP regarding funding of research projects on Tuberculosis, Scabies, Rational use of anti-malarial drugs, prevention of tobacco use and Dengue control in tribal areas of M.P. on 8th July 2016.

12. EVENTS

"International Day of Yoga" celebrated on 21st June, 2016.

International Day of World's Indigenous Peoples was celebrated on 9th August 2016.

The local tribal youths/students, Principals of schools and Sarpanch from various villages of Baigachak part of IEC intervention project on malaria at Dindori area were awarded on International Day of World's Indigenous Peoples, celebration at NIRTH, Jabalpur.

The 70th Independence Day celebrated on 15th August, 2016 with zeal and enthusiasm at NIRTH, Jabalpur.

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Vigilance awareness week, 2016 was observed on 19th September, 2016 by Dr. Neeru Singh Director and all members of NIRTH pledged to maintain transparency and integrity in all spheres of the activities.

The "68th Republic Day" was celebrated on 26 January, 2017.

Science Day was celebrated on 28th & 29th February, 2017.

The 34th Foundation Day of ICMR-NIRTH, Jabalpur was celebrated on 1st March 2017 at NIRTH, Jabalpur, MP, and Keylong Field Station, Lahaul & Spiti, Himachal Pradesh.

13. APPENDICES

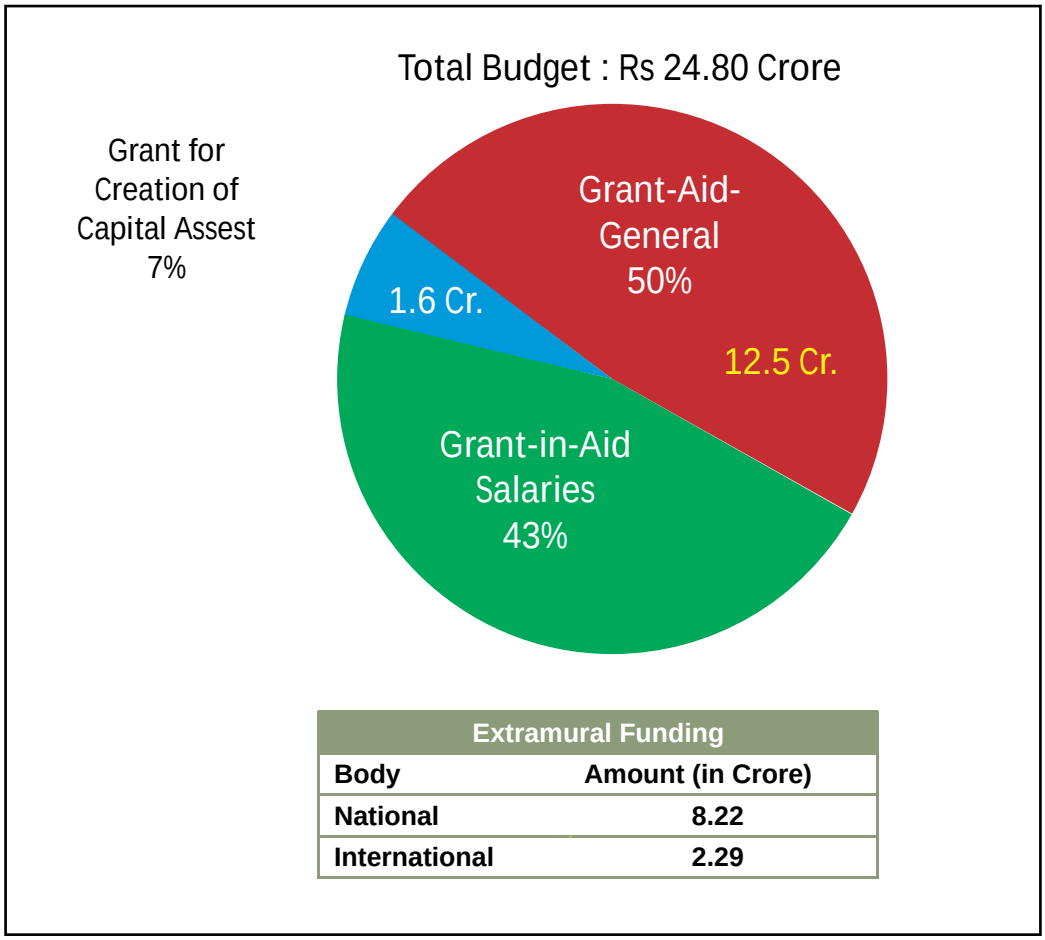
13.1. PROMOTION/RETIREMENT/TRANSFER

Retirement

- Sh. P. Vinay Rao, Senior Technical Officer (1) retired on 30th April 2016.
- Dr. Jyotirmoy Roy, Senior Technical Officer (1) retired on 30th June 2016.
- Sh. M.L. Patel, Senior Technician (2) retired on 31st July 2016.

13.2. BUDGET

Budget for 2016-17



Extramural Funding	
Body	**Amount (in Crore)**
National	**8.22**
International	**2.29**

13.3. COMMITTEES

Scientific Advisory Committee		
Lt. Gen. (Dr.) D. Raghunath	Ex-Director General, Armed Forces Medical Services	Chairman
Dr. P.L. Joshi	Former Director, NVBDCP, New Delhi	Member
Dr. D.T. Mourya	Director, NIV, Pune	Statutory Member
Dr. Roshan Colah	Former O/C, NIIH, Mumbai	Member
Dr. S.C. Dubey	Ex-Joint Director, HSADL, Bhopal	Member
Dr. Pawan Ghanghoriya	Consultant Paediatrician, NSCB Medical College, Jabalpur	Member
Prof. P.B. Sengupta	HOD, Deptt. Of Sociology and Social Work, RDVV, Jabalpur	Special Invitee
Dr. Sher Singh Kashyotia	Assistant Director, NVBDCP, New Delhi	Representative NVBDCP
Dr. Harpreet Kaur	Scientist-E, ICMR, New Delhi	Programme Officer & ICMR Representative
Dr. Neeru Singh	Director, NIRTH, Jabalpur	Member Secretary

Institute Local Building Monitoring Committee- (Capital Works)		
Sh. A.K. Soni	Retired spreintending Engineer (Elect.)	Member (Outside, Expert)
Sh. RK Rawat,	Exeective Engineer, Survey Research Circel JBP	Member (Outside, Expert)
Sh. Gyan Chand Jain	Admn. Officer, NIRTH, JBP	Member
Sh. Pramod Kumar	Accounts Officer, NIRTH, JBP	Member

Dissemination of Information Committee		
Dr. Jyothi Bhat	Scientist-E, NIRTH, JBP	Chairperson
Dr. Ravendra K. Sharma	Scientist-D, NIRTH, JBP	Member
Dr. Pradip Barde	Scientist-D, NIRTH, JBP	Member
Dr. Arvind Verma	Technical Assistant-R, NIRTH, JBP	Member
Sh. Avinash Dubey	Technician-A, NIRTH, JBP	Member

Rapid Response Team		
Dr. Tapas Chakma	Scientist-G, NIRTH, JBP	Chairman
Dr. Jyothi Bhat	Scientist-E, NIRTH, JBP	Member
Dr. Pradip Barde	Scientist-D, NIRTH, JBP	Member
Seven supporting staff (Technical/others)		

Library Committee		
Dr. V.G. Rao	Scientist-G, NIRTH, JBP	Chairman
Dr. K.B. Saha	Scientist-E, NIRTH, JBP	Member
Dr. Jyothi Bhat	Scientist-E, NIRTH, JBP	Member
Dr. S. Rajasubramaniam	Scientist-E, NIRTH, JBP	Member
Dr. Ravendra K. Sharma	Scientist-D, NIRTH, JBP	Member
Sh.Gyan Chand Jain	Admn. Officer, NIRTH, JBP	Member
Sh. Pramod Kumar	Accounts Officer, NIRTH, JBP	Member
Sh. S.N. Singh	TO(A), NIRTH, JBP	Member Secretary

Staff Grievance Committee		
Dr. V. G . Rao	Scientist-G, NIRTH, JBP	Chairman
Dr. Dinesh Kumar	Scientist-D, NIRTH, JBP	Member
Sh. Gyan Chand Jain	Admn. Officer, NIRTH, JBP	Member
Sh. Pramod Kumar	Accounts Officer, NIRTH, JBP	Member
One representative of TEWA	--	Member
Sh. R.K. Thakur	Section Officer, NIRTH, JBP	Member

Anti-sexual Harassment Committee		
Dr. Jyothi Bhat	Scientist-E, NIRTH, JBP	Chairperson
Dr. K.B. Saha	Scientist-E, NIRTH, JBP	Member
Dr. Ravendra K. Sharma	Scientist-D, NIRTH, JBP	Member
Dr. Alpana Abbad	Technical Assistant-R, NIRTH, JBP	Member
Smt. Nazia Anwar Ali	Technical Assistant, NIRTH, JBP	Member

Annual Report Committee		
Dr. Jyothi T. Bhat	Scientist-E, NIRTH, JBP	Chairperson
Dr. K.B. Saha	Scientist-E, NIRTH, JBP	Member
Dr. P.V. Barde	Scientist-D, NIRTH, JBP	Member
Dr. Ravendra K. Sharma	Scientist-D, NIRTH, JBP	Member
Dr. Vidhan Jain	Scientist-D, NIRTH, JBP	Member
Dr. Nishant Saxena	Scientist-B, NIRTH, JBP	Member
Dr. Manjunathachar H V	Scientist-B, NIRTH, JBP	Member
Dr. Arvind Verma	Technical Assistant-R, NIRTH, JBP	Member
Dr. Arun Kumar	Consultant,THRU, NIRTH, JBP	Member

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	rrh;	Jh vjfon dfo'oj] ofj"B rduhdh vf/kdkjh ¼1½	#- 2000@&
	lkRouk ¼I½	Mk- fnu'k dekj] oKkfud ^Mh	#- 1000@&
	lkRouk ¼II½	Mk- ljUn dekj] oKkfud ^Mh	#- 1000@&
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	rrh;	Jh lck"k pUn enyh] futh lgk;d	#- 2000@&
	lkRouk ¼I½	d- vtyh jktir] voj J.kh fyfid	#- 1000@&
	lkRouk ¼II½	Jh jkfgr vxoky] lgk;d	#- 1000@&
5-	rkRdkfyd fgnh fuc/k&y[ku ¼ifj;ktuk LVkQ@LVMVl leg½		
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	f}rh;	d- fi;dk [kku] i;kx'kkyk rduhf'k;u	#- 3000@&
	rrh;	Mk- fgek'k flg pny] Mh,lVh ^bUlik;j^ QdYVh	#- 2000@&
	lkRouk ¼I½	Jh ifru'k dekj ijkgk] i;kx'kkyk rduhf'k;u	#- 1000@&
	lkRouk ¼II½	Jh luhy ifMr] i;kx'kkyk lgk;d	#- 1000@&
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	iFke	Mk- ujUn dekj pk/kjh] ofj"B rduhdh vf/kdkjh ¼1½	#- 5000@&
	f}rh;	Mk- v'kkd dekj feJ] oKkfud ^b^	#- 3000@&
	rrh;	Mk- fnu'k dekj] oKkfud ^Mh^	#- 2000@&
	lkRouk ¼I½	Jh 0gh- lku] ofj"B rduhdh vf/kdkjh ¼1½	#- 1000@&
	lkRouk ¼II½	Mk- ljUn dekj] oKkfud ^Mh^	#- 1000@&
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lkRouk ¼II½	Jh ,y- ,l- dk'ky] ofj"B rduhdh vf/kdkjh ¼1½	#- 1000@&
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13.5. STAFF LIST

Director & Scientist `G'		
Dr. Neeru Singh, MSc, PhD, FNASc		Passed Away: 19th Aug.2017
Scientist Cadre		
Dr. V.G.Rao, MBBS, MD	Scientist `G'	Community Medicine
Dr. Tapas Chakma, MBBS, MAE	Scientist `G'	Community Medicine
Dr. Man Mohan Shukla, MBBS	Scientist `F'	Community Medicine
Dr. Ashok Kumar Mishra, MSc, MA, PhD	Scientist `E'	Entomology
Dr. Kalayan Brata Saha, MSc, MPS, PhD, PGDBE	Scientist `E'	Demography
Dr. Gyan Chand, MSc, PhD	Scientist `E'	Entomology
Dr. Jyothi T. Bhat, MBBS, MD	Scientist `E'	Microbiology
Dr. S. Rajasubramaniam, MSc, PhD	Scientist `E'	Biotechnology
Dr. Dinesh Kumar, MSc, PhD	Scientist `D'	Statistics
Dr. Surendra Kumar, MBBS	Scientist `D'	Community Medicine
Dr. Ravendra Kumar Sharma, MPhil, PhD	Scientist `D'	Biostatistics
Dr. Pradip Vijay Barde, MSc, PhD	Scientist `D'	Microbiology
Dr. Praveen Kumar Bharti, MSc, PhD	Scientist `D'	Biotechnology
Dr. Rajiv Yadav, MBBS, MD	Scientist `D'	Community Medicine
Dr. Vidhan Jain, MSc, PhD	Scientist `C'	Microbiology
Sh. S.B. Barman, MSc, M.Phil	Scientist `B'	Social & Behavioural Sciences
Dr. Manjunathachar H.V., MVSc., PhD., PGDRD	Scientist `B'	Veterinary sciences*
Dr. Nishant Saxena, MSc, D.Phil.	Scientist `B'	Anthropology**
Dr. Ravindra Kumar, MSc, PhD	Scientist `B'	Genetics^
Dr. Suyesh Shrivastava, MBBS, MD	Scientist `B'	Community Medicine#
Dr. Anil Kumar Verma, MSc, M.Phil, PhD	Scientist `B'	Life Sciences$

Scientist joined on *9th Jan., ** 13th Feb., ^1st Mar., #3rd Mar. and $15th Mar. 2017

Administration

Sh. G.C. Jain	Administrative Officer
Sh. Pramod Kumar	Accounts Officer
Sh. D.P.Lodhi	Section Officer (Estt.)
Sh. R.K.Thakur	Section Officer(Store)

Library

Sh. S.N.Singh	Senior Technical Officer (1)

Technical Staff

Dr. Jyotirmoy Roy	Senior Technical Officer (1) Retired on 30th Jun.2016
Sh. P. Vinay Rao	Senior Technical Officer (1) Retired on 30th Apr.2016
Sh. V. Soan	Senior Technical Officer (1)

Dr. N.K.Choudhari	Senior Technical Officer (1)	
Dr. R.C.Mishra	Senior Technical Officer (1) Retired on 31st May2017	
Sh. Arvind Kavishwar	Senior Technical Officer (1)	
Dr. Arvind Verma	Senior Technical Officer (1)	
Dr. B.K.Tiwari	Senior Technical Officer (1)	
Dr. Alpana Abbad	Senior Technical Officer (1)	
Sh. Praval Shrivastava	Senior Technical Officer (1)	
Sh. Ajay Kumar Goel	Senior Technical Officer (1)	
Sh. M.P.S.S. Singh	Senior Technical Officer (1)	
Dr. M.K. Bhondeley	Senior Technical Officer (1)	
Sh. Mohan Lal Kori	Senior Technical Officer (1)	
Sh. R.K. Minocha	Senior Technical Officer (1)	
Sh. Chandan Karformas	Senior Technical Officer (1)	
Sh. Subhash Godbole	Senior Technical Officer (1)	
Sh. L.S.Kaushal	Senior Technical Officer (1)	
Sh. A.K. Gupta	Senior Technical Officer (1)	
Mrs. Reena Shome	Senior Technical Officer (1)	
Sh. Anil Gwal	Senior Technical Officer (1)	
Sh. Lalit K. Sahare	Senior Technical Officer (1)	
Sh. Mahendra Jaidev Ukey	Senior Technical Officer (1)	
Sh. Prakash C. Srivastava	Senior Technical Officer (1)	
Mrs. Nazia Anwar Ali	Technical Officer	
Mrs. Maya Pandey	Technical Assistant (R)	
Sh. Vivek Kumar Chouksey	Technical Assistant	
Ms. Sneha Bhandari	Technical Assistant	Joined on 11th Jul.2016
Sh. Nitish Singh Parihar	Technical Assistant	Joined on 15th Sep.2016
Sh. Sri Krishna	Technical Assistant	Joined on 15th Sep.2016
Ms. Sweta Mishra	Technical Assistant	Joined on 6th Mar.2017
Sh. Prakash Tiwari	Technical Assistant	
Mrs.Canina Luke	Senior Technician (3)	
Sh. Purushottam Patel	Senior Technician (3)	
Sh. C.P. Vishwakarma	Senior Technician (3)	
Sh. Subhash Kumbhare	Senior Technician (3)	
Sh. B.S.Patel	Senior Technician (3)	
Sh. D.C.Khatarkar	Senior Technician (3)	
Sh. D.K. Mishra	Senior Technician (3)	
Sh. S.R.Mishra	Senior Technician (3)	
Sh. M.P. Tiwari	Senior Technician (3)	
Sh. Ram Kumar Verma	Senior Technician (3)	

Sh. Rakesh Kumar Jaiswal	Senior Technician (2)	
Sh. Ajesh Kumar Dubey	Senior Technician (2)	
Sh. Ghanshyam Ahirwar	Senior Technician (2)	
Sh. Mahendra Kumar Jain	Senior Technician (2)	
Sh. M.L. Patel	Senior Technician (2)	Retired on 31st Jul.2016
Dr. Shiv Kumar Singh	Senior Technician (2)	
Sh. Jagdish Prasad Mishra	Senior Technician (2)	
Sh. Vijay Kumar Kachhi	Senior Technician (2)	
Sh. Ashok Kumar Saini	Senior Technician (3)	
Sh. Paramjeet Singh	Senior Technician (3)	
Sh. Ramesh Kumar Gond	Senior Technician (2)	
Sh. Genda Lal Gond	Senior Technician (2)	
Sh. Pradeep Kumar Namdeo	Senior Technician (2)	
Sh. Ravindra Kumar Katraha	Senior Technician (1)	
Sh. Santosh Kumar Patkar	Technician-C	
Sh. Hari Barman	Technician-C	
Sh. Neelu Mishra	Technician-C	
Sh. Rameshwar P.Khedekar	Technician-C	
Sh. Pradeep Kumar Tiwari	Technician-C	
Sh. Surendra Kumar Jhariya	Technician-C	Joined on 6th Mar.2017
Sh. Shashikant Tiwari	Technician-C	Joined on 9th Mar.2017
Sh. Avinash Dubey	Technician-A	
Sh. Prakash Sangle	Technician-A	
Sh. Shashi Bhushan Dubey	Technician-A	
Sh. Anoop Kumar Vishwakarma	Technician-A	Joined on 6th Jul.2016
Sh. Surendra Singh Mehra	Technician-A	Joined on 15th Jul.2016
Sh. Ramswaroop Uikey	Technician-A	Joined on 15th Jul.2016
Ms. Mala Prajapati	Technician-A	Joined on 15th Jul.2016
Sh. Dhan Singh Thakur	Laboratory Assistant	Expired on 6th Jan.2017
Sh. Sheikh Saleem	Laboratory Assistant	
Sh. Sukhlal Vishwakarma	Laboratory Assistant	
Sh. K. Venu Gopal Rao	Laboratory Assistant	
Sh. Jagdish Prasad Thakur	Laboratory Assistant	
Sh. Suresh Kumar Burman	Laboratory Assistant	
Sh. Rajendra Prasad Gond	Laboratory Assistant	
Sh. Shankar Lal Jha	Laboratory Assistant	
Sh. Kamta Prasad Jaiswal	Laboratory Assistant	
Sh. Laxman Prasad	Laboratory Assistant	
Sh. Baidhraj Kachhi	Laboratory Assistant	
Sh. Madan Singh Maravi	Laboratory Assistant	
Sh. Pritam Lal Gond	Laboratory Assistant	

Sh. Suresh Kumar Pareha	Laboratory Assistant	
Sh. Ramesh Kumar Ahirwar	Laboratory Assistant	
Sh. Suresh Kumar Jaiswal	Laboratory Assistant	
Sh. Umesh Prasad Gautam	Laboratory Assistant	
Sh. Anil Kumar Vinodia	Laboratory Assistant	
Sh. Malikhan Singh	Laboratory Assistant	
Sh. Ajay Kumar Soni	Laboratory Assistant	
Sh. Santosh Kumar Kol	Laboratory Assistant	
Sh. Prem Singh Gond	Laboratory Assistant	
Sh. Ram Kumar Mehra	Laboratory Assistant	
Sh. Summat Singh Maravi	Laboratory Assistant	
Sh. Ganga Bahadur	Laboratory Assistant	
Sh. Arakh Chand Malik	Laboratory Assistant	
Sh. Vishnoo Prasad	Laboratory Assistant	
Sh. Sone Lal Dumar	Laboratory Assistant	
Sh. Pappu Lal Dumar	Laboratory Assistant	
Sh. Munnalal	Laboratory Attendant (2)	
Mrs. Shashi Prabha Mishra	Laboratory Attendant (2)	
Sh. Shamshad Ali Ansari	Laboratory Attendant (2)	
Sh. Vinay Kumar Balmik	Laboratory Attendant (2)	
Sh. Santosh Kumar Haldkar	Laboratory Attendant (2)	

Administrative Staff

Sh. Hakim Singh Thakur	Jr. Hindi Translator	
Sh. Subash C. Muduli	Personal Assistant	
Sh. Rohit Agrawal	Assistant	
Mrs.Filomina Lakra	Assistant	
Sh. P.K.Shrivastava	Assistant	Retired on 31st May2017
Sh. Raj Kumar Handa	Assistant	
Ms. Sandhya Sharma	Assistant	Joined on 14th Sep.2016
Sh. Bhagwani Prasad Kol	Upper Division Clerk	
Sh. Raghubir Prasad	Upper Division Clerk	Retired on 31st May 2017
Sh. Baishakhu Lal Urreti	Upper Division Clerk	
Sh. Sarthak Soni	Stenographer	Joined on 29th Mar.2017
Sh. Pramod Kumar Choubey	Lower Division Clerk	
Sh. Sharad Kumar Kosta	Lower Division Clerk	
Sh. Narendra Kumar Jhariya	Hindi Typist	
Sh. Rahul Koshta	Lower Division Clerk	Joined on 6th May 2016
Sh. Vikas Kumar Gupta	Lower Division Clerk	Joined on 6th May 2016
Ms. Anjali Rajput	Lower Division Clerk	Joined on 6th May 2016
Sh. Santosh Kumar Maravi	Multi tasking staff	Joined on 9th Sep. 2016

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Director

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