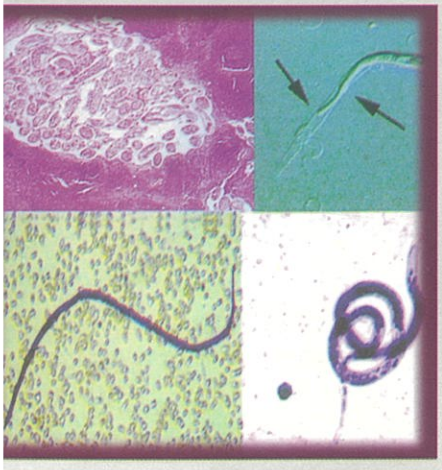
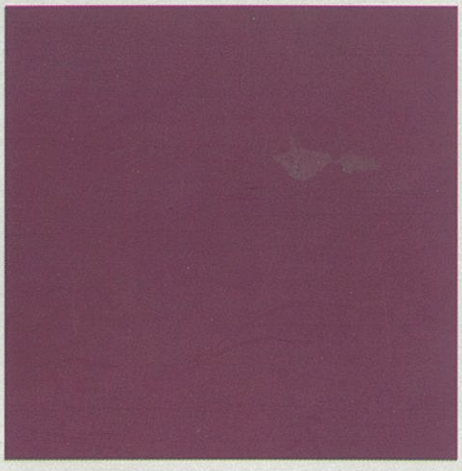
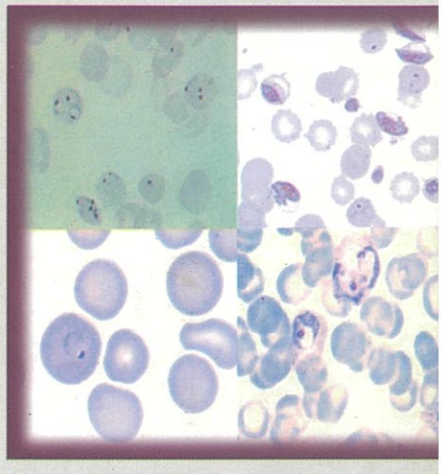
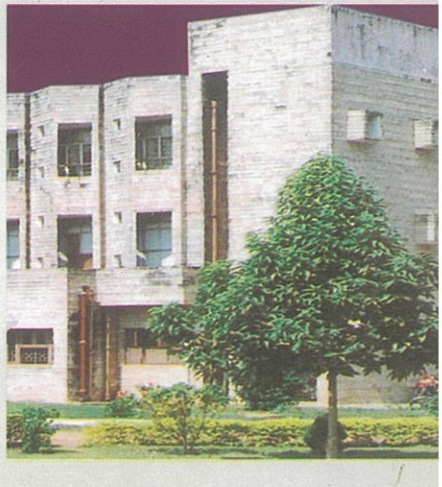
Annual Report

2004-05





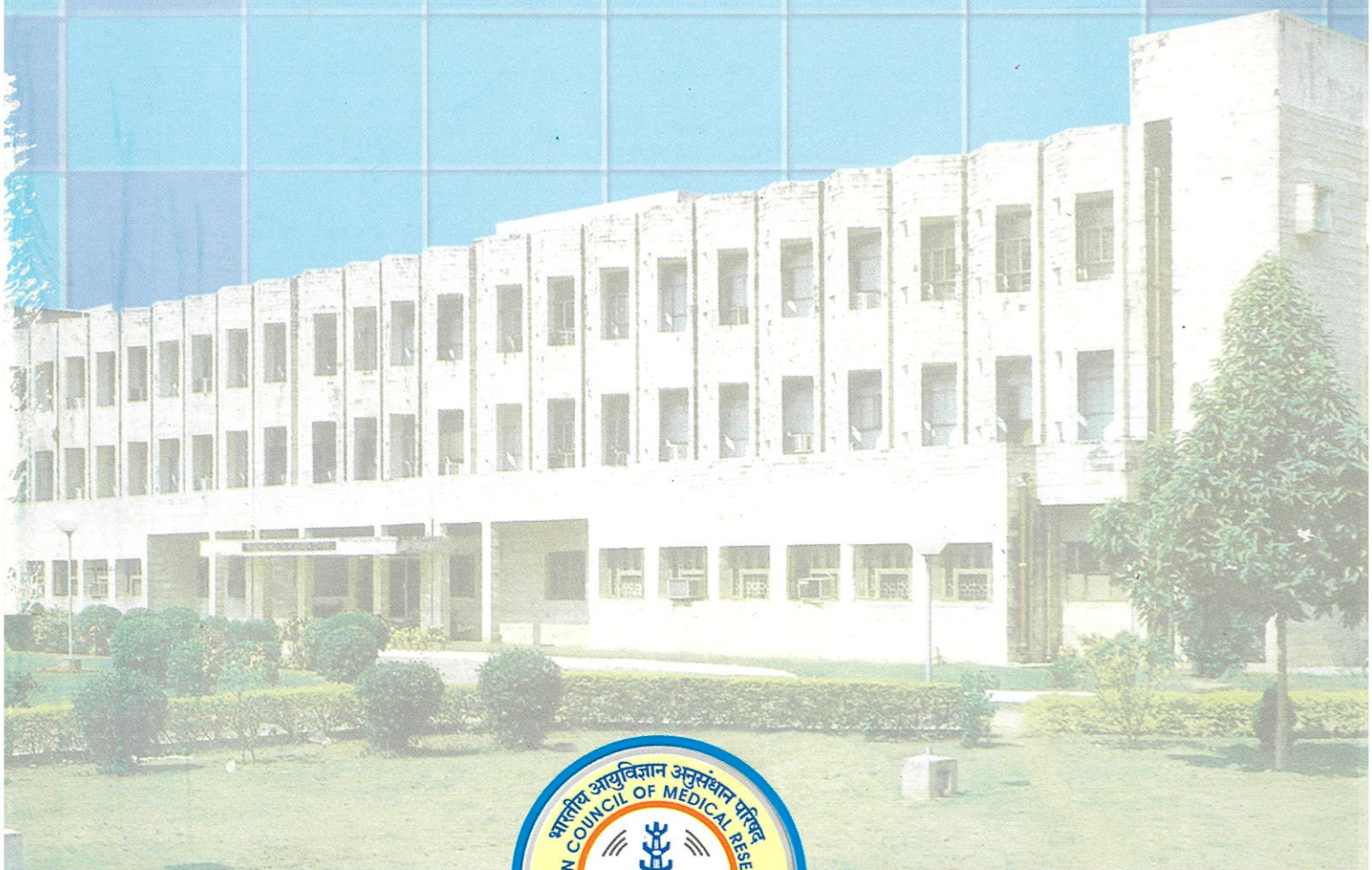




REGIONAL MEDICAL RESEARCH CENTRE
(INDIAN COUNCIL OF MEDICAL RESEARCH)
BHUBANESWAR

Annual Report

2004-05



REGIONAL MEDICAL RESEARCH CENTRE
(INDIAN COUNCIL OF MEDICAL RESEARCH)
BHUBANESWAR

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PREFACE

During the year attention was given to strengthen quality of research output, linkages with local health authorities and improving quality of work force by recruiting research fellows from various reputed organizations. Besides areas like linkages with national disease control programmes and infrastructure development were emphasized.

Research activities are addressed to issues pertaining to priority areas of diseases prevalent in this region like filariasis, micronutrient deficiency disorders, tribal health and malaria. New research programmes that can contribute towards malaria control in this region have been planned. Research issues are addressed on basic, applied and operational areas intending to develop morbidity markers of infection and develop tools and strategies for control of filariasis. Out of 27 projects, 13 are completed and 22 are extramural that helped resource generation.

Major focus of research in lymphatic filariasis is to develop candidate antigen as immunoprophylactic agent for filariasis. Two filarial antigens, i.e. a glycoprotein and a lipid, isolated from *S.digitata* has shown lack of antibody response in active filarial infection and induced antimicrofilarial immunity against microfilaria in Mastomys. The potential role of recombinent antigens derived from developmental stages of parasite like ALT2, CPI2 conferring antimicro filarial immunity were identified. Using large panel of pro and anti inflammatory molecules, morbidity markers to differentiate various clinical spectrum of filarial disease were developed. To assess exposure level to filarial infection, monitoring tools are being developed using IgG and IgM assay for use in filarial control programme. Innovative strategy for drug delivery during mass drug administration in filariasis control for urban areas has been developed, tested and found successful in improving compliance to the desired level. To address the issues on role of Wolbachia in post DEC reactions, the study indicated that post DEC reactions are independent either to presence and density of microfilaria or to plasma Wolbachia density. The issues on adverse reaction to DEC in the programme are being evaluated.

Malaria is a major health problem in this region. Prevalence of drug resistance profile of parasite like mutations of pfCRT (K76T) and pfmdr1 (N86Y) genes have been shown. The therapeutic efficacy of chloroquine tested in Kalahandi district has shown very high frequency of drug resistance. Insecticide resistance and parasite diversity in three districts were assessed that can help planning control strategy. To facilitate the national programme, four malaria endemic districts were monitored monthly to improve the output.

Micronutrient deficiency disorder and under nutrition is prevalent in this region. State government sponsored project on anaemia among non-school going adolescent girls in three districts indicated very high prevalence (>90%) and identified associated factors of anaemia. Intervention studies addressed to tribal population manifesting anaemia indicated reduction of anaemia in nearly 25% of subjects. Intervention studies amongst tribal population addressed against cholera, intestinal parasitism, scabies and Vit-A deficiency has shown significant reduction of these morbid conditions.

For prevention of sickle cell disease and thalassemia, several tribes were studied in Sundargarh district with interventional approach through IEC and genetic counselling. Social issue like domestic violence has shown association with reproductive health outcome.

Meritorious research fellows awarded with CSIR, UGC or ICMR fellowships were recruited for pursuing Ph.D. Around twenty students sponsored by various universities of the state and outside the state completed their M.Sc. project work. Three students were awarded Ph.D this year. Students undertaking MD course in medical colleges are undertaking their project work under the guidance of our scientists. Medical officers, public health personnel and CDMOs of all the districts were given training on mass drug administration against filariasis as sponsored by local health authority. Sainik school & B.Sc. students of Biotechnology institutes were exposed to modern instrumentation and biotechnology techniques in the Centre.

Many scientists were sent to reputed institutes in India and abroad to acquire new technologies, like pharmacodynamics, microarray techniques and in library science. The scientists have participated and presented their original work in national and international conferences in India and abroad.

The Centre organized several scientific meetings, lectures and workshops during the period. International workshop on methodology in medical research and epidemiology was organized. In collaboration with local health authority workshop on epidemic preparedness in malaria, emerging and re-emerging infection and professional development course for doctors working in government health care were conducted. Seminar and journal clubs and scientific lectures by invited eminent speakers were organized.

The linkages with other upcoming institutions locally, other national and international institutions were established either in form of training or transfer of technology or sponsoring research. Networking with other ICMR institutes like MRC, NIN, NIRRH, NIV, NICED, RMRC(T) were made in form of collaborative research or transfer of technology.

Six monthly news bulletin and library news letters were published and distributed to disseminate information. Besides, booklets on haemoglobinopathy and tribal health issues and prevention methods were published by the Centre and distributed to increase public awareness.

Human and animal ethical committee meetings were conducted periodically. Proper maintenance of animal house was done by regular check-up by veterinary expert. Celebrations like National Science Day and Centres Foundation Day were organized by staff inviting eminent speakers.

The collaboration with state health authorities were strengthened by providing regular OPD services at Capital Hospital on filariasis, diagnostic services on malaria, sickle cell disease and thalassemia and regular surveillance of diarrhoeal disorders and by investigation of outbreak of hepatitis and diarrhoea. Besides frequent interaction with three medical colleges, State AIDS Cell and local health authorities are made. State Government sponsored projects on anaemia, CQ resistance and bed net assessment were executed with timely submission of reports.

Equipping lab and training of scientists in modern techniques strengthened infrastructure of molecular biology laboratory and micronutrient laboratory. The library facility was updated with LAN facility, internet connectivity, free access to several online journals and network connectivity.

Laboratory equipments worth nearly a crore rupees were procured to strengthen the laboratory. The staff quarters were repaired, renovated, new animal facility construction was completed and construction of auditorium, new guest house, hostel facility for trainees and horticultural activity were undertaken this year.

During the year the Centre generated 88 lac rupees (nearly 20%) of annual budget through 22 extramural projects both from national and international level. During 2004, calendar year the Centre published 16 research papers mostly in SCI journals with an average impact factor of 2.34. During 2005 till date, 9 publications are accepted/published of which 7 are SCI publications.

There are 99 regular staff in position that included 16 scientists with various expertise who catered to accomplish output. During the year Council provided an annual budget of Rs.399.92 that were utilized for Centre's activities.

The scientists and staff of this Centre made continuous effort and contributed to significant output of the Centre. I sincerely thank scientists and staff for their endeavour and contributions. I am also thankful to the State health department and other agencies and collaborating institutes for their assistance and co-operation. I extend my deep gratitude to Council for its continuous support, guidance and encouragement. With all round support, the Centre can continue its endeavor to achieve its goal.

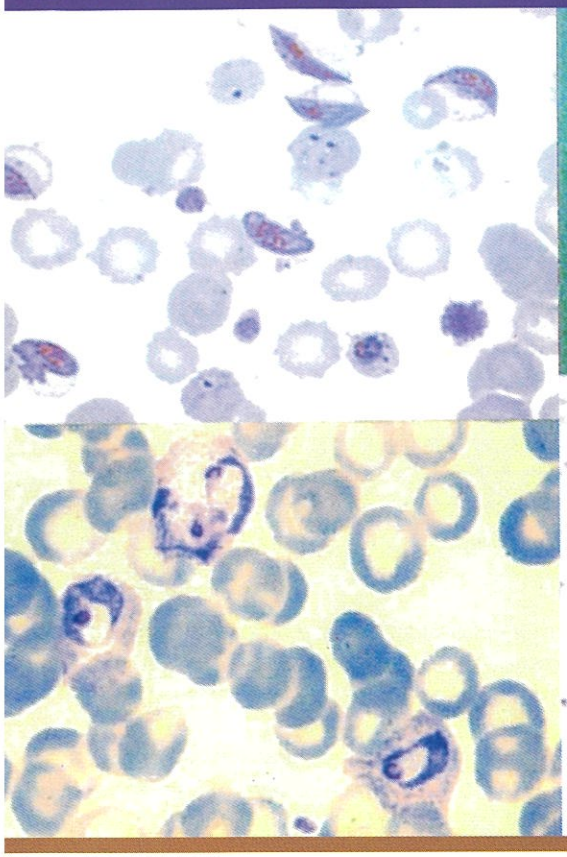
S. K. Kar

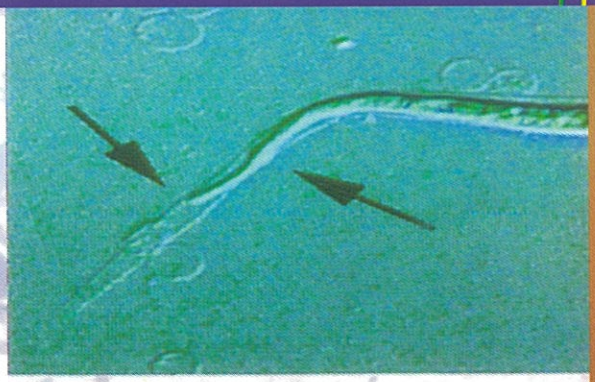
RESEARCH HIGHLIGHTS
(2004-2005)

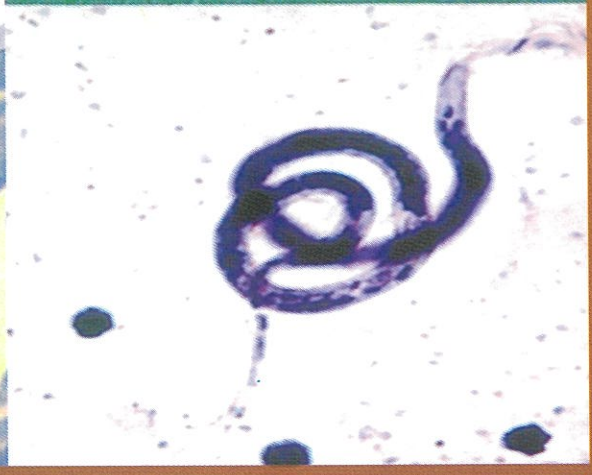
The centre continued to address issues on filariasis, malaria, micronutrient deficiency disorder, tribal health and haemoglobinopathies. Two filarial antigens present on the surface of filarial parasites, Dssd1 and lipid fractions, have shown to mediate clearance of circulating microfilariae in animal model system – S. digitata infections in Mastomys coucha. Studies on innate immunity in filariasis showed that susceptible strains of mice (DBA/2) possessed significantly lower surface TLR-4 receptors than resistant (Balb/C) strains of mice. Filarial antigens bound significantly to a surface receptor on human as well as murine mononuclear cells suggesting innate recognition of filarial antigens by host immune cells. The antigen was found to be a very high molecular weight glycoprotein (> 100 Kd). Identification of the surface receptor is expected to reveal the molecular mechanisms of innate immunity in filariasis. The issue of Mass Drug Administration (MDA) in filariasis and side reactions observed in human communities after MDA with Diethylcarbamazine citrate, the anti-filarial drug being currently used for control of lymphatic filarisis was addressed. A study was undertaken to investigate the association between Wolbachia density and post-DEC reactions. Patients were treated with single dose of DEC to monitor reactions both clinically as well as sub-clinically by measuring inflammatory molecules viz., TNF-a, IL-6 and RANTES as well as to quantify Wolbachia to analyze any association between them. The major conclusions that can be drawn at this stage of the study are: a) post-DEC reactions are dependent on presence and density of circulating Mf and is related to plasma Wolbachia density in microfilarial; b) Post DEC reactions in AS and CH cases appear to be qualitatively different (raised TNF-a vs RANTES respectively) suggesting a dichotomy in the underlying mechanism of DEC mediated reactions in filarial endemic subjects.

Four primitive tribes Bondo, Didayi, Kandha and Juanga were investigated for nutritional anemia, sickle cell anemia, b-thalassemia, diarrhoeal disorders including cholera, geohelminths and amoebiasis. The prevalence of genetic disorders were low in comparison to infectious diseases indicating that timely intervention could reduce morbidity and promote good health. However, sickle cell and Hb-E disorders were found in high frequency in Dhelki Kharia tribes of Sundargarh in Orissa. Molecular typing of the P. falciparum isolates showed a strong association between severe manifestation of the diseases and incidence of *P.falciparum* isolates harbouring both Pfcrt (K76T) & pfmdr1 (N86Y) mutation, the genes responsible for CQ resistance. In Anugul district of Orissa, out of five sibling species of *An.culicifacies,* species B and C are found to be prevalent and both were found to be resistant to DDT but susceptible to Deltamethrine.

1. ON GOING STUDIES







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1.14 Study of health consequences of domestic violence with special reference to reproductive health

1.15 Molecular monitoring of *Vibrio cholerae* in hospitalized diarrhoeal patients and aquatic environment in Puri district of Orissa"

On Going Studies

1.1 Lymphatic filariasis in young children: an immunological prospective

Status : Intramural

Investigators : Dr. M.K. Das, Dr. M.K. Beuria, Dr. M.S. Bal and Mr. N.N. Mandal

Starting date : August 2001

Closing date : August 2004

Objectives:

1. To detect pre-patent infection through IgG4 and circulatory filarial antigen assay.
2. Prevalence of anti-filarial antibodies in different age classes in children.

Background information:

Children (n=565) below 15 years of age of filarial endemic villages of Khurda district of Orissa were recruited in the study. Microfilaria prevalence rate among children was observed 6.54%. Presence of circulating filarial antigen (CFA) was determined using Og4C3 test kit. About 32% of the children were found CFA positive. Majority of CFA positivity (25%) was detected in asymptomatic amicrofilaraemic children. Infection free children (antigen negative) were checked whether these subjects were exposed to the infection or not. About 95% IgG positivity to *S. digitata* antigenic extract was observed indicating that these children were well exposed to filarial infection. Prevalence of IgG antibodies to filarial antigens (*Setaria digitata* antigen and Dssd1) in different age classes of endemic children was determined. More than 50% children were observed IgG positive by age of 5 years.

Results:

In order to check the transplacental transfer of filarial antigen and antibody, cord blood along with the maternal blood samples were collected from Khurda (district hospital), an area endemic for *W.bancrofti* infection. IgG and IgM antibodies to *Setaria digitata* antigens were determined in both maternal and cord blood samples (n=154). IgG positivity of 85% and 43% were observed in maternal and cord blood respectively. Similarly, IgM positivity rate of 55% was noticed in maternal blood samples. Only one cord blood sample was found positive for the same antibody. About 35% of mothers were found IgG positive to Dssd1 antigen vs. 10% in cord blood samples

Presence of circulating filarial antigen (CFA) was checked in maternal and corresponding cord blood samples. About 56% of mothers were found antigen positive whereas 18% of cord blood samples were found positive for antigen.

1.2 Immunochemical characterization of filarial Glutathione S-transferase and its protective potential in experimental filariasis.

Status : Extramural (DST)

Investigators : Dr. M. K. Beuria, Dr. M.K. Das, Dr. M.S. Bal

Starting Date : March 2005

Closing Date : February 2008

Objectives:

1. To determine recognition pattern of anti-Glutathione-S- transferase (GST) antibodies (SDS-PAGE and immunoblotting) in filarial sera.
2. To determine the cytokine responses specific to GST in filariasis.
3. To evaluate the protective potential of GST to clear microfilariae in experimental infected animal.

Progress:

Glutathione-S-transferase (GST) are essentially detoxification enzymes helps in parasite survival against host induced damage. These enzymes have been used as vaccine candidate antigens in schistosomiasis, fascioliasis and in chaga's disease. In this study we have purified GST from adult *Sitaria digitata* (the cattle filarial parasite) through Glutathione Agarose column to evaluate such role in human filariasis. IgG and IgM antibodies to Glutathione-S-transferase were determined in individuals living in areas endemic for W. bancrofti infection. About 90% of asymptomatic microfilaraemics (AS) and chronic filariasis (CP) patients were IgG positive

compared to about 20% positivity in endemic normal (EN) individuals. IgM levels did not differ much among filarial groups such as EN, AS and CP groups. Seropositivity of 90% were observed in CP and AS group of patients. About 50% positivity was observed in endemic normals.

1.3 Innate immune recognition of filarial parasites by phagocytes

Status :
EM (Parasite Immunity Task Force of ICMR)
Investigator :
Dr. B. Ravindran
Starting date : January 2003
Closing date : December 2005

Objectives of the proposal:

1. To identify and characterise the molecular moieties from filarial parasites binding to murine antigen-presenting cells (APCs)
2. To identify murine APC surface receptors recognising filarial molecular targets
3. To study the signal transduction contributions of the newly identified APC receptors in mediating phagocyte activation in response to filarial parasite targets
4. To evaluate the roles of the identified receptor-ligand pairs in regulating filarial clearance in vivo

Progress:

Microfilarial clearance is poorer in DBA/2 mice despite having normal levels of Btk:

As mentioned in the last annual report we had observed that two mouse strains with the same MHC haplotype [H-2d] namely BALB/c and DBA/2 showed differential response to mf proteins as well as the ability of mice to clear mf from circulation. This year we report further characterisation of these findings.

We began with the assumption that if there is a difference in the mf clearing ability *in vivo*, it is likely that a strain showing better clearance is more likely to be a candidate to possess a receptor for mf. We used BALB/c and DBA/2, both of H-2d haplotype and BALB/c is known to clear mf rapidly. *S. digitata* mf were given [$5x10^5$ per mouse] intraperitoneally (i.p.) and microfilaraemia was tracked over a period of time.

Figure 1 shows that within two weeks DBA/2 mice show very high numbers of mf/10 µl of blood, while in BALB/c mice no mf are detected. After about 30-40 days of injection microfilaraemia subsides in DBA/2 mice. We have published a similar finding earlier attributable to Bruton's tyrosine kinase [Btk]. In xid mice, which are deficient in functional Btk due to a mutation in plekstrin homology domain, there is high microfilaraemia as compared to the wild type [WT] CBA/J mice [1]. So as preliminary evidence we looked at the levels of Btk in the peritoneal macrophages of these mice. Whether activated *in vitro* with LPS or not, cell lysates of elicited peritoneal macrophages from BALB/c and DBA/2 mice show comparable levels of Btk signal in the Western blot as shown in Figure 2. The antibody used does not detect functionality or otherwise of Btk, however, it shows that the levels of the protein present in cells are comparable.

Our earlier data had indicated the macrophage effector functions to be contributing to the differences in mf clearance observed rather than any major impact of the adaptive immune system. Hence we tried to characterise the effector functions and the cell-surface receptors, which might trigger the effector functions including TLR receptors.

Analysis of effector functions in macrophages from BALB/c and DBA/2 mice:

We analysed effector functions of macrophages with two aims in mind. One, whether microfilarial proteins affect macrophage functions differentially in the two strains of mice and two, whether known TLR-ligation on macrophages is bringing about differential outcome in the two strains of mice.

Peritoneal macrophages from BALB/c and DBA/2 strains of mice were cultured in presence of various doses of *S. digitata* mf extract, *B. pahangi* mf extract or purified AgW antigen for 48 hours and the ability of these macrophages to produce nitric oxide was measured by nitrite accumulation in the supernatant by Greiss reaction. Figure 3 shows that macrophages from DBA/2 mice which clear mf more slowly produce less of nitrite in response to all mf antigens tested, as compared to macrophages from BALB/c mice. Since the possibility of LPS contamination in mf extracts cannot be ruled out, we used polymixin-B to counter LPS effects

and estimated nitrite accumulation in a similar assay – in presence and absence of polymixin-B. Figure 4 shows that when high levels of nitrites were produced on stimulation, presence of polymixin-B could bring about reduction in nitrite production to near background levels as in BALB/c macrophages. However there was no reduction in nitrite producing ability of DBA/2 macrophages in presence or absence of Polymixin-B. More importantly, responses to a purified mf antigen AgW were also inhibited by polymixin-B in BALB/c macrophages [Fig 4] indicating that AgW may also be using an LPS-mediated activation pathway to produce effector molecules in macrophages. This raised a possibility of BALB/c and DBA/2 macrophages expressing a partially non-overlapping set of TLRs.

We used LPS, a ligand for TLR-4 and peptidoglycan [PG], a ligand for TLR-2 to stimulate macrophages from the two strains of mice. Interferon-γ [IFNg] is a known activator of macrophages, which works independent of TLRs and hence was used as a positive control. Data in Figure 5 show DBA/2 macrophages consistently produce less nitrites in all the assays, though with IFNg and PG as stimulators the differences in nitrite production from macrophages of the two strains are only marginal. In contrast, on LPS activation, macrophages from DBA/2 mice produce much less nitrite than those from BALB/c mice. The results have been consistent and BALB/c macrophages produce the same amount of nitrites with 30-50 fold lower dose of LPS. We have also used a TLR-3 ligand poly-I,poly-C to look at the nitrite producing capacity of macrophages and in preliminary experiments find that poly-IC is more potent in stimulating BALB/c macrophages than the DBA/2 macrophages [data not shown].

We have begun to look at another effector function of macrophages namely production of reactive oxygen intermediates [ROI] and ability to secrete various cytokines. In preliminary experiments we have looked at the ability of macrophages to produce ROI in response to LPS over a 6-hour period. The fluorescence of the dye diaminofluorescenediacetate [DCFDA] added in culture is detected by fluorimeter periodically to estimate comparative levels of ROI produced. Figure 6 shows that macrophages from BALB/c mice produce higher levels of ROI as compared to DBA/2 macrophages in response to LPS indicating that both the effector functions – production of RNI and ROI go hand in hand as far as the differences in the two sets of macrophages are concerned.

Macrophages from two mouse strains were stimulated with titrating amounts of IFN-g or LPS for 48 hours and supernatants were collected. Levels of IL-1b, TNF-1 and IL-12 in the supernatants were analysed by commercially available reagents. Figure 7 shows levels of the cytokines after IFN-g stimulation, where the ability of 2 sets of macrophages is comparable. In contrast, macrophages from BALB/c mice are 10 to 1000 fold more sensitive to LPS dose to produce the same amount of the cytokine in the supernantant as seen in Figure 8.

Analysis of TLR-4 in macrophages:

We next decided to focus on TLR-4 to see if the levels of TLR-4 are different in the two strains of mice. Peritoneal resident cells [PRCs] and elicited cells [PECs] from BALB/c and DBA/2 mice were used to look for TLR-4 expression by flowcytometry. Figure 9 (A, B, C) shows the staining pattern when phycoerythrin [PE]-coupled anti-TLR-4 antibody was used. BALB/c PRCs show a good uniform staining 30-fold above the background stain. In contrast, DBA/2 PRCs show only a subset of cells positive for TLR-4. The intensity of this staining is also much lower than that observed in BALB/c PRCs [Fig 9a].

On BALB/c PECs the staining intensity went down rather than up and only a subset showed positivity [Fig 9b]. The levels and numbers were even lower in DBA/2 PECs. On ligand binding TLR-4 can be internalised. In intestinal epithelial cells TLR-4 has been shown to be present intracellularly in association with its ligand LPS. Whether that can be the case in macrophages and whether such a receptor would be actively functional is not known. However, other family memebers of TLR are present intracellulalry as well. Hence we looked at the total TLR-4 levels in these macrophages after cell permeabilisation. As compared to Figure 9b, which shows different surface TLR-4, levels in BALB/c and DBA/2 macrophages, total TLR-4 levels after permeabilisation are comparable as shown by superimposing curves in Figure 9c. The next question was whether addition of TLR-4 ligand in culture would alter these levels.

LPS was added for 2 hours in adherent PEC cultures and surface as well as total TLR-4 levels in macrophages were analysed by flowcytometry. Figure 10a shows surface staining whereas Figure 10b shows total staining for TLR-4. LPS-activated BALB/c PECs show much higher levels of surface TLR-4 as compared to DBA/2 PECs, and both show upregulation in levels on LPS treatment, indicating that signalling through TLR-4 may result in its increased surface expression.

In order to see whether macrophages from DBA/2 are deficient in cell surface expression of all TLRs we used a TLR 2 detecting antibody. Similar to Figure 10, staining before and after permeabilisation was carried out in LPS stimulated or unstimulated macrophages. Figure 11shows that in macrophages from both the strains TLR-2 levels were comparable in every situation. Thus, the differences observed may be TLR-4 specific.

The data show that, unlike TLR-4 mutant mice C3H/HeJ, macrophages from DBA/2 mice have normal levels of TLR-4 but unlike macrophages from BALB/c mice a significant proportion of TLR-4 remains intracellular. Further significance of these findings needs to be evaluated.

Analysis of filarial antigen binding to mouse macrophages and human monocytes:

The above studies on filarial antigen induced intracellular signalling in mouse macrophages (presumably through TLR4 as shown above) necessitated the search for identification of filarial antigens that specifically bind to host cell surface molecules. Biotinylated adult filarial antigens bound significantly to human peripheral blood monocytes (Fig 12). This binding could be consistently demonstrated on monocytes of nine normal human subjects (Fig 13). More significantly the specificity of this binding was shown by competitive inhibition with non-biotinylated filarial antigens (Fig 14). This suggests the presence of specific filarial recognition molecules on normal human monocytes. Similar molecules were completely absent on human lymphocytes.

Unlike human lymphocytes, recognition molecules for filarial antigens could be recognized in normal mice. About 15-20% of lymphocytes in spleen of three different mouse strains CBA/J, Balb/C and C3H/HeN bound filarial antigens specifically (Fig 15). About 35% of the mouse macrophages of the three strains bound filarial antigens (Fig 16). There was no significant difference between the three strains of mice. We now propose to identify 1) host receptors in wild type as well as TLR-4 deficient macrophages that bind filarial antigens and also identify 2) the nature of parasite antigen(s) that bind to human monocytes and macrophages. It is also proposed to use mouse strains deficient for different genes such as IFN-g, IL-10, iNOS, ICAM-1, Btk, IL-4 etc. to study their respective macrophages for binding filarial antigens.

Fig. 1.

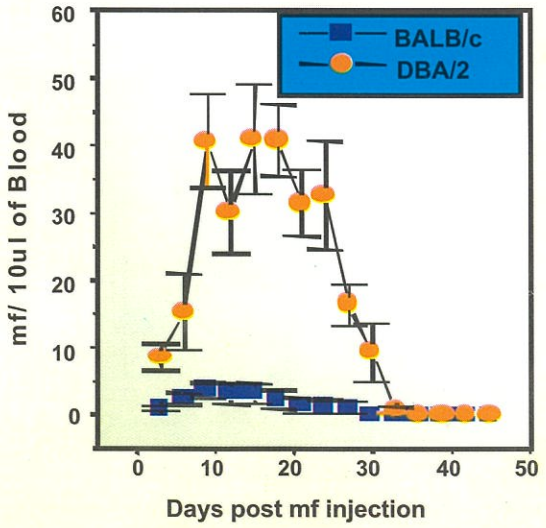


Fig. 2.

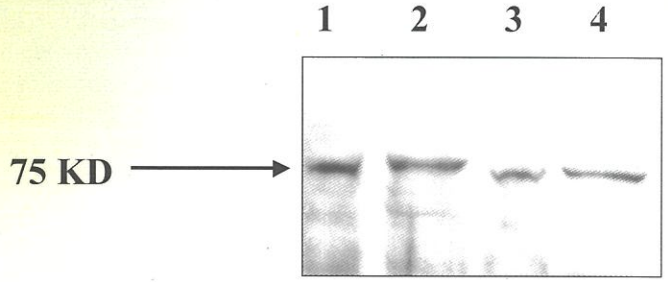


Fig. 3.

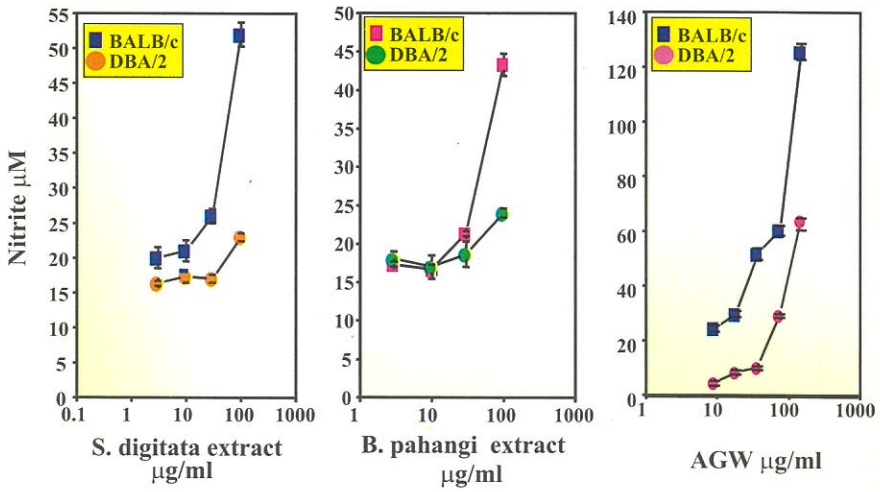


Fig. 4.

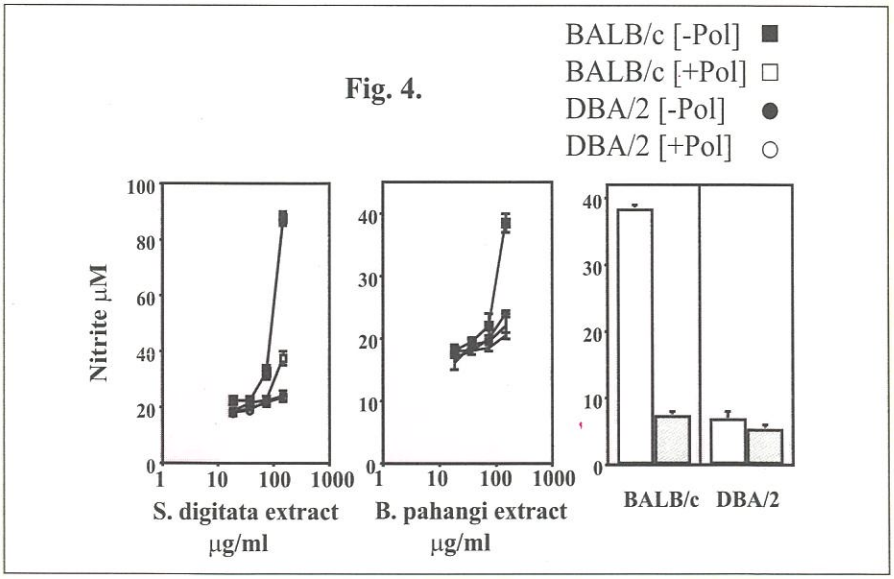


Fig. 5.

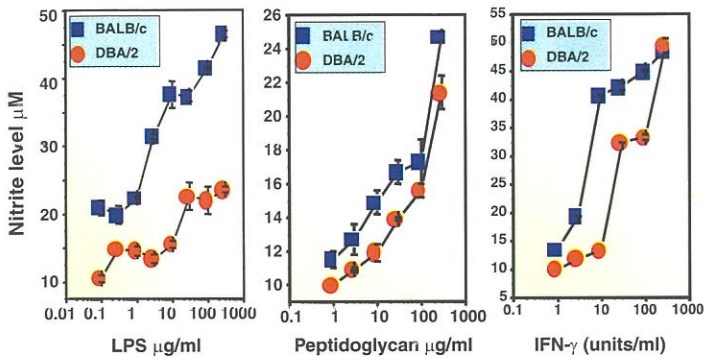


Fig. 6.

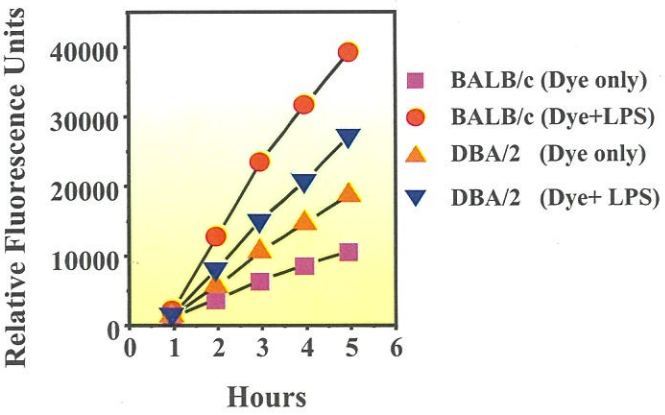
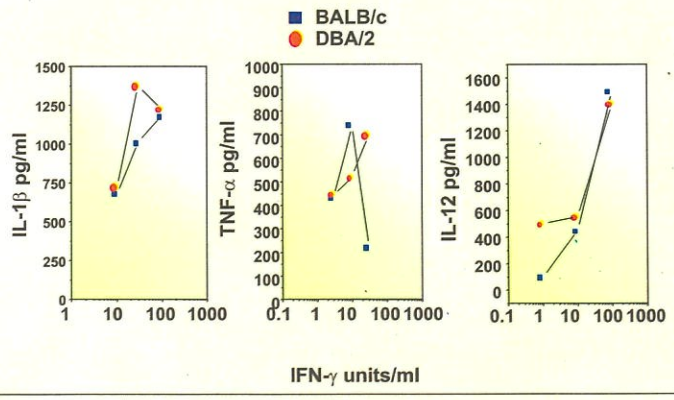


Fig. 7.



On Going Studies

Fig. 8.

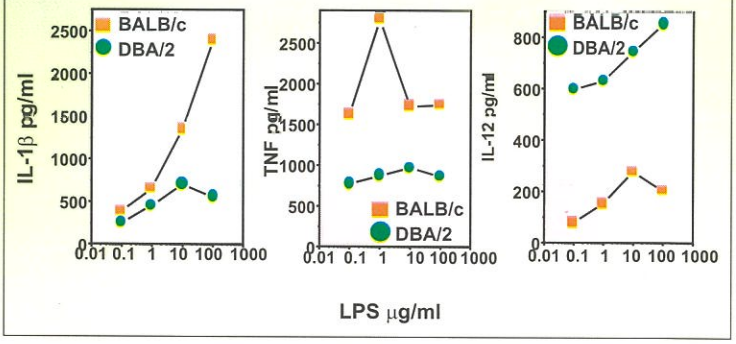


Fig. 9.

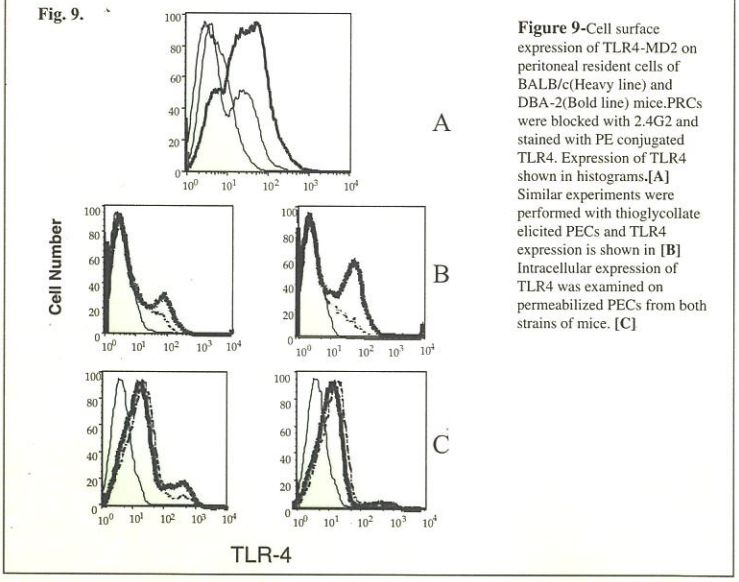


Figure 9-Cell surface expression of TLR4-MD2 on peritoneal resident cells of BALB/c(Heavy line) and DBA-2(Bold line) mice.PRCs were blocked with 2.4G2 and stained with PE conjugated TLR4. Expression of TLR4 shown in histograms.**[A]** Similar experiments were performed with thioglycollate elicited PECs and TLR4 expression is shown in **[B]** Intracellular expression of TLR4 was examined on permeabilized PECs from both strains of mice. **[C]**

Fig. 10.

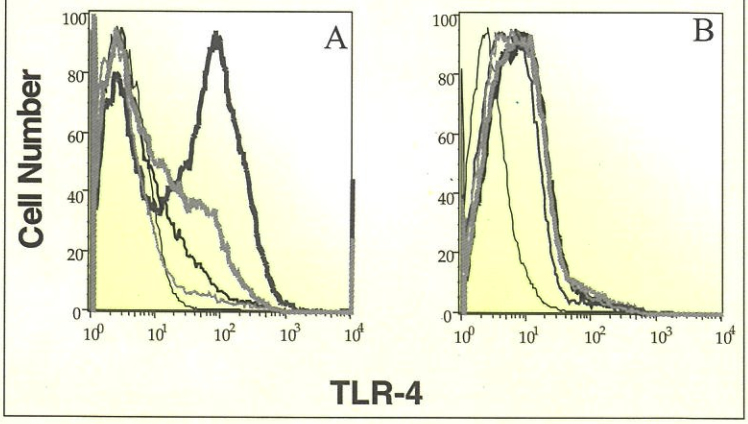


Fig. 11.

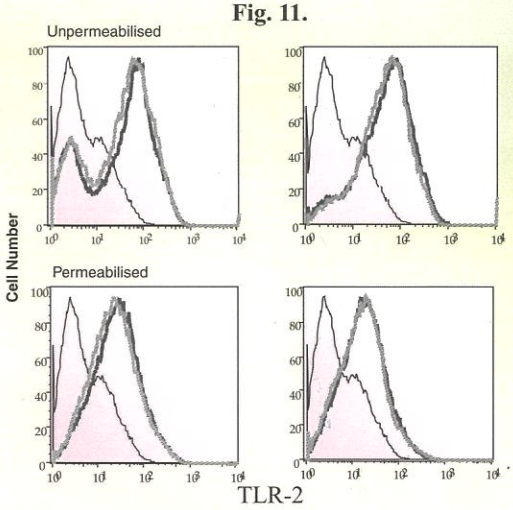
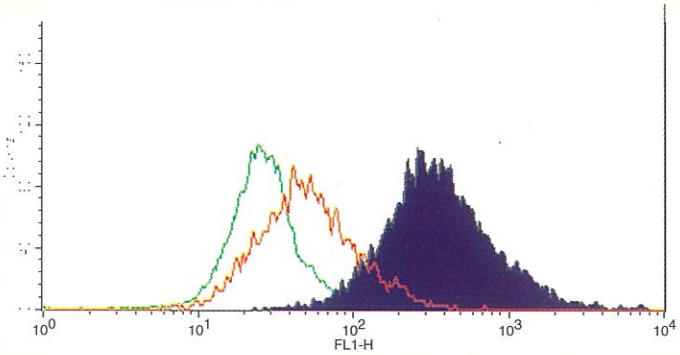


Fig.12. Identification of filarial specific innate receptors on human phagocytes

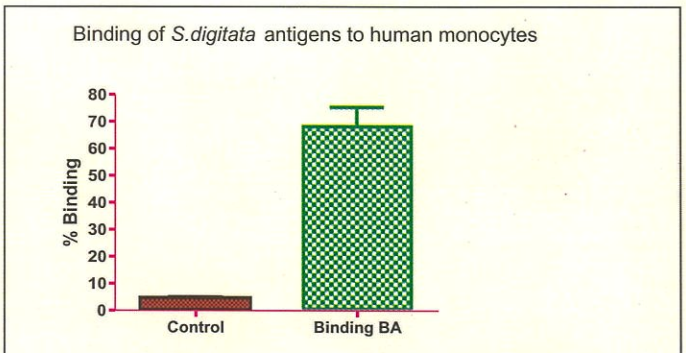


Green line: Conjugate Control

Red line: Antigens binding to monocytes of filariasis infected cases

Blue shaded area: Antigens binding to monocytes of cases free of infection

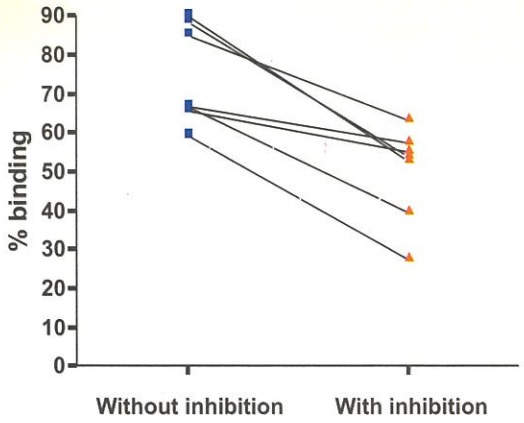
Fig. 13



Biotinylated soluble antigens from adult female worms were tested for binding to normal human monocytes and quantified by flow cytometry in the gated population ; mean ± SD of 9 samples(P<0.0001)

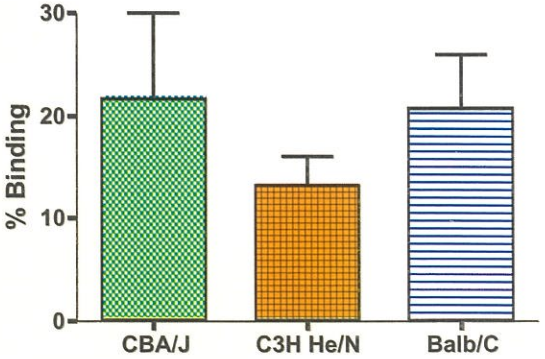
Fig. 14

Inhibition of binding of filarial antigen to monocytes



The specificity of binding of biotinylated filarial antigen to monocytes by competitive inhibition with cold non-biotinylated) antigen at a ratio of 1:1 (n=7; P=0.0032)

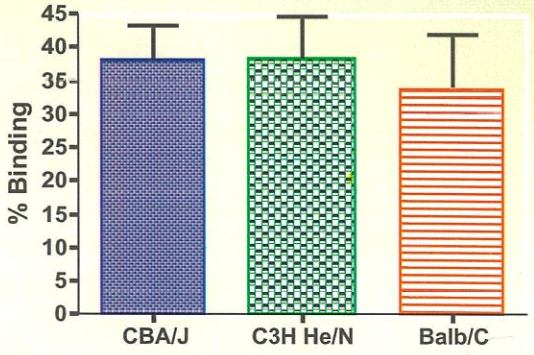
Fig. 15



Flow cytometry:

Binding of filarial antigen to lymphocytes in spleen of three different mice strains -(CBA/J, n=4; C3H He/N,n=6 and Balb/C, n=6) . There was no statistically significant difference between the mice strains.

Fig-16



Flow cytometry :
Binding of Filarial antigens to macrophages in spleen of three different mice strains (CBA/J, n=4;C3H He/N,n=6 Balb/C ,n=6) are comparable.

1.4 Post-DEC reactions in Human Bancroftian Filariasis: An Immunobiological study in Orissa, India

Status :
Indo-German initiative, GOI

Investigators :
Dr. B. Ravindran (PI), Dr. S.K. Kar (CI)
Dr. Achim Hoaeruf (German Collaborator)

Starting date : March 2003
Closing date : February 2006

Objectives:

1. To study the role of endosymbionts *Wolbachia* in mediating reactions after administration of Diethylcarbamazine in infected human subjects.
2. To study the role endosymbionts *Wolbachia* in mediation of inflammatory responses in human filariasis during acute disease episodes

Background:

Two different approaches were taken in the study as described under methods. In the first, cohorts of Mf carriers have been treated with Doxycycline or placebo and then treated with DEC to monitor overt clinical reactions as well as plasma cytokine levels to score inflammation. The working hypothesis is that if Wolbachia are responsible post DEC reactions, treatment with Doxycycline would effectively result in absence of reactions after DEC administration in the treated cohort. The study is being conducted in 3 phases, the first phase was completed fully in October 2004 and the second phase will be completed in June 2005. The third phase will be completed in October 2005 and the results will be compiled at the end of 3rd phase. The second approach is take three groups of subjects: 1) Asymptomatic Mf carriers 2) Subjects with cryptic infection, i.e., amicroilaraemic but with circulating filarial antigen and 3) patients with chronic disease but with no demonstrable infection and to treat all the three cohorts with single dose of DEC and monitor reactions

On Going Studies

and cytokine and Wolbachia levels and pre and post DEC administration. The observations made are shown in Table 1.

Work Progress:

The project addressed the issue of reactions observed in human communities after administration of Diethylcarbamazine citrate, the anti-filarial drug being currently used for control of lymphatic filariasis. It is generally believed to be associated with microfilarial density in the subject although empirical data for this is not available. Since post-DEC reactions often appear similar to LPS mediated inflammation and an endobacteria such as Wolbachia are known to reside in Mf, the current study was undertaken to investigate the association between Wolbachia density and post-DEC reactions. The under laying principle is that Wolbachia are susceptible to tetracyclines/doxycyclines and DEC mediated reactions should be preventable in Mf carriers by pre-treatment with the above antibiotics. Two strategies were followed; first, to treat Mf carriers with doxycycline for different duration and then administer DEC to monitor reactions both clinically as well as sub-clinically by measuring inflammatory molecules viz., TNF-a, IL-6 and RANTES as well as Wolbachia to analyze correlations between them; second, to treat cohorts of subjects, (with and without patent infection) with DEC and analyze correlations as described above. The first approach is being pursued independent of the second approach; it is being done in three phases- in each phase 4 groups of Mf carriers are being used, one placebo and three treated with doxycycline for different durations (5, 10 and 21 days) and subsequently treated with DEC to monitor reactions; the first phase and second phase have been completed and phase 3 is underway. The final data with analysis is expected to be available by the end of 2005. Treatment of mf for 21 days with doxycycline resulted in significant decrease of Wolbachia in mF during treatment administred for 10 to 5 days did not significantly decrease mf Wolbachia load and there was no change in placebo treated group (Fig. 1, 2 & 3). Post DEC reaction correlated significantly with higher level of Wolbachia in Mf indicating that Wolbachia are the possible origin of adverse reactions in Mf carriers (Fig.4).The following is the summary of results for the second approach: 1) Pre-treatment TNF-a levels were significantly more in Mf carriers (AS) and patients with chronic filarial disease (free of detectable infection) in comparison to subjects with cryptic infection (amicrofilaraemic with filarial antigenemia only), 2) Post–DEC reactions were significantly more in AS and CH cases as compared to CR cases and prevalence was comparable in the two (AS & CH) groups, 3) post DEC reactions were associated with significant elevation of TNF-a only in AS cases and not in CH cases, 4) conversely, significantly elevated levels of RANTES was observed only in CH cases and not in AS cases after administration of DEC, 5) plasma IL-6 levels were found to be significantly elevated in AS cases in comparison to CR and CH categories (pre drug administration) and after DEC administration, the levels of IL-6 decreased significantly in CR and CH cases and not in Mf carriers, and 6) plasma Wolbachia levels (as shown by real-time PCR) significantly decreased within 24 hrs after DEC consumption in CR and CH groups and not in the AS group.

	PRE DEC Level							POST DEC Level				
Group	RAN (ng/ml) mean ±SEM	TNF- a (pg/ml) mean±SEM	IL-6 (pg/ml) mean±SEM	Mf /ml mean+SEM	CFA(Ag.unit) mean+SEM	Mf. Wol. No.copy/100 mf	Pla.Wol. No.copy/ul mean±SEM	RAN (ng/ml) mean ± SEM	TNF- a (pg/ml) mean ±SEM	IL-6 (pg/ml) mean±SEM	Pla.Wol. No.copy/ul mean±SEM	Clinical Reaction till 72 hrs
1. MF carrier (n=10)	168.5+56.91	73.76+22.73	1251+406	1645+553	26060+3515	115.05+71.61	.294+.126	203.3+40.93	234.3+105.9	1015+372	.559+.232	5 out of 9 (55.55%)
2.Cryptic infection (n=19)	185.6+38.63	38.94+8.188	475.3+106.4	NA	10520+3207	NA	8.810+4.87	198+27.22	69.09+21.88	162.7+66.78***	.1615+.0712	2 out of 18 (11.11%)
3. Chronic disease (n=18)	115.2+22.33	79.91+30.29	532.3+130.6	NA	NA	NA	3.617+3.101	202.5+33.49*	68.05+15.54	137.3+47.94***	.1455+.0499	5 out of 16 (31.25%)

*Post RANTES increased in significantly in comparison to pre levels(t=2.14, p=0.0409)

**48 hrs reaction is significantly more in AS group than Cry groups p=0.023.

***Post IL-6 decreased significantly in group CRY (t=2.488; p=0.0176)and CH (t=2.840;p=0.0080)groups

The post DEC reactions in microfilaraemic subjects and patients with chronic disease were comparable. The reactions were negligible in subjects with cryptic infections. This suggests essentially that post-DEC reactions are not restricted to subjects with active current infection and that patients with chronic disease without demonstrable filarial infection also could display reactions. This notion is further confirmed by the lack of reaction in subjects with cryptic infection. Expectedly, Fig 1 and fig 2 show absence of relationship any significant relationship between Mf density (fig 1) and Wolbachia density (Fig 2) with post-DEC reactions.

On Going Studies

Fig. 1

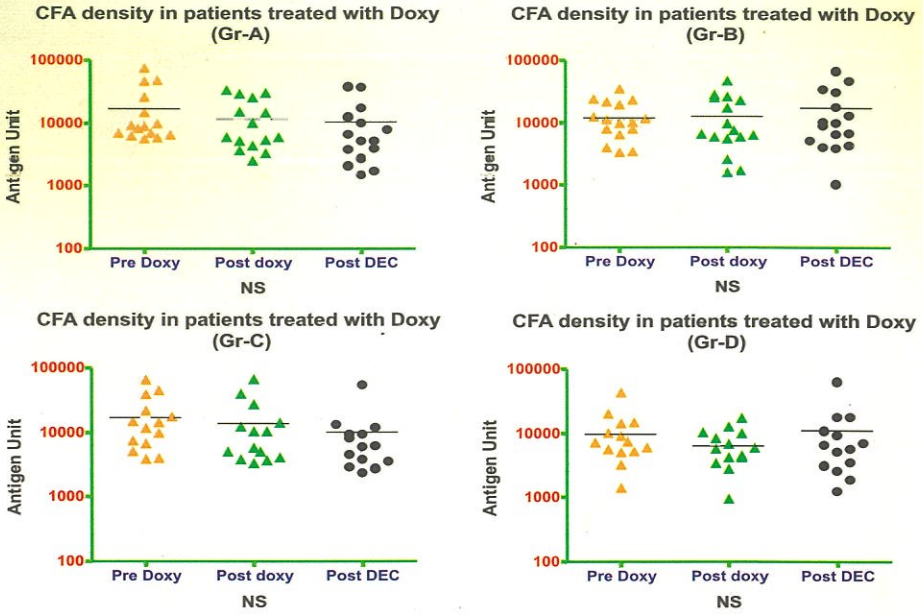


Fig. 2

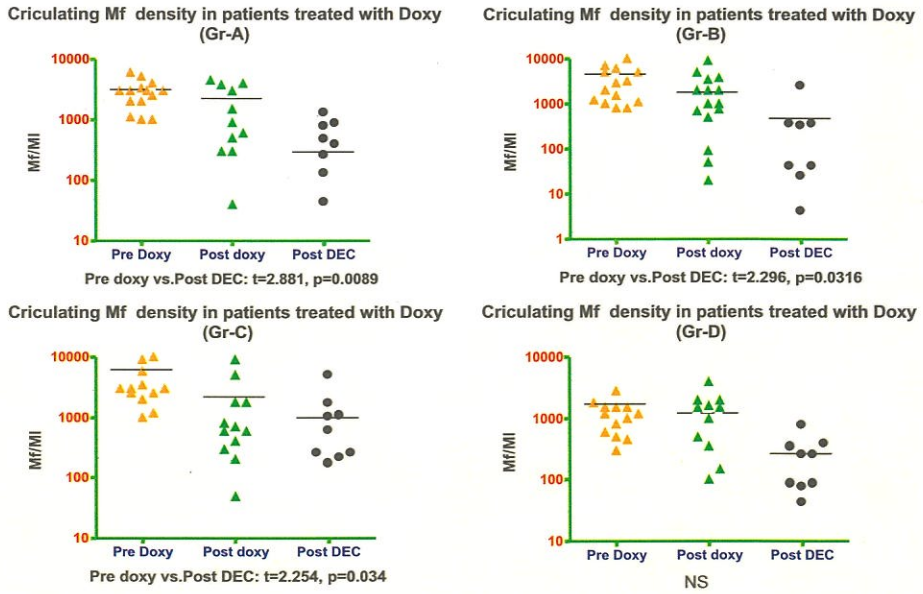
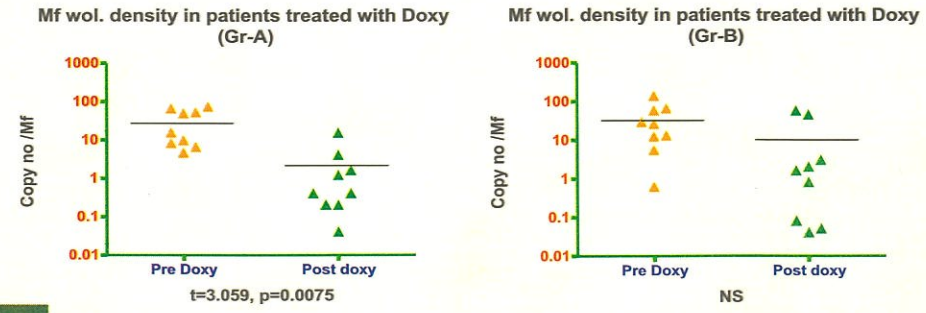


Fig. 3



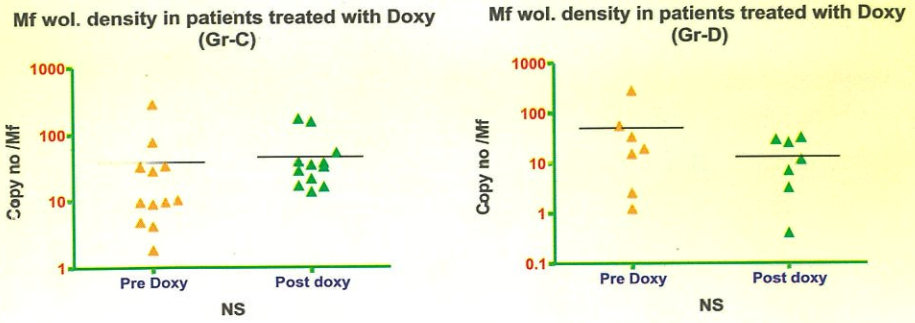
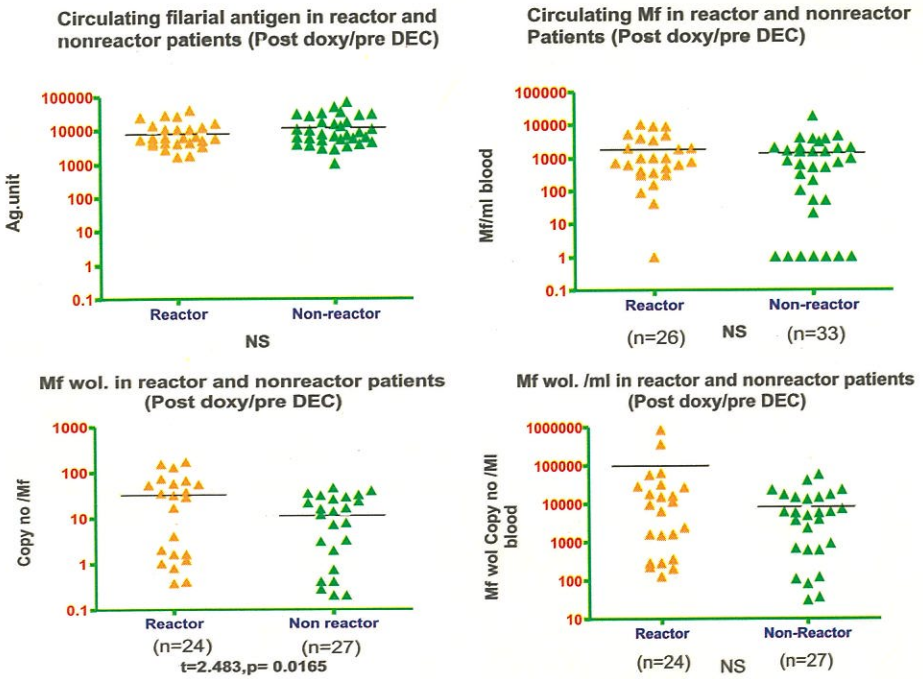


Fig. 4



There was a significant increase in plasma TNF-a levels at 24 hrs after administration of DEC in Mf carriers and not in CR and CH cases (Fig 5). Conversely, RANTES was found to be elevated only in CH cases and not in AS and CR subjects (Fig 6) indicating a dichotomy in the mechanism involved in post-DEC reactions observed in AS and CH cases.

Fig. 5.

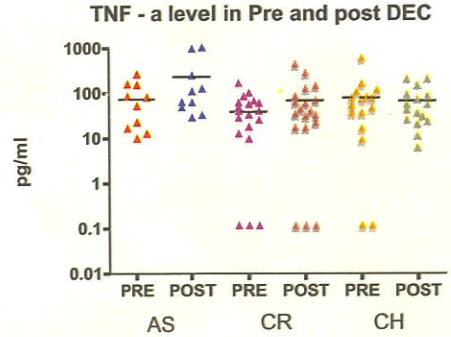
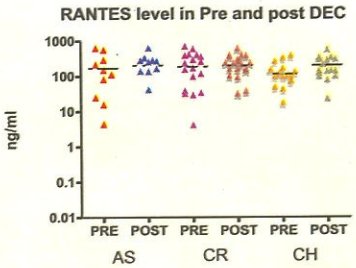


Fig. 6.



CH group: Pre vs. Post
t=2.140, p=0.0409

On Going Studies

Status : Intramural

Investigators : Dr. A.K. Satapathy, Dr. P.K. Sahoo, Dr. B. Ravindran

Starting date : February 2002

Closing date : January 2005

1.5 Identification of serum immunosuppressive factors in human filariasis

Objectives:

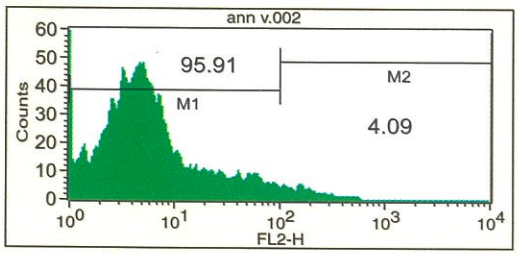
1. To identify the immunosuppressive factors in sera of microfilaraemic subjects.
2. To correlate the degree of immunosuppression with presence/Intensity of infection with adult stage parasite.

Initial investigation indicated that microfilariamic sera mediated profound inhibition of PHA induced T-cell proliferation. An attempt has been made to characterize the immunosuppressive factors in microfilariaemic sera. Inhibitory serum factor was dialyzable. The serum inhibitory factor was found to be resistant to treatment at 56°C for 30 mins. Further, Aminoguanidine, an inos inhibitor failed to reverse serum mediated inhibition. Tho possible cytotoxicity to lymphocytes mediated by inhibitory sera was studied. Identification of apoptotic cells in 96hrs cultures was performed by flow cytometery using annexin V – PE apoptosis detection kits. Serum inhibitory factor(s) in mf carriers induced apoptosis of lymphocytes as shown by Annexin V staining (Fig-1). Analysis of factors and the mechanism of induction of apoptosis are currently under study.

Indirect evidence indicates that IL-10 and/or TGF-β play a role in generating hyporesponsiveness to parasite antigens. Thus both IL-10 and TGF-β have been shown to play an important role in down regulating antigen specific proliferative responses in microfilariaemic subjects. However the relationship between IL-10 and TGF-β with immunosuppression observed in human filariasis is still not known. The relationship between IL-10 and TGF-β with the degree of immunosuppression is being analyzed. TGF-β levels has been quantified in inhibitory microfilariaemic sera and correlated with % inhibition. TGF-β levels in sera were found to correlate inversely with % inhibition (Fig-2). We had demonstrated earlier that significantly elevated levels of IL-10 in acute filariasis in comparison to endemic controls, Mf positive cases and cryptic cases. IL-10 levels in culture supernatants of PHA stimulated Peripheral Blood Mononuclear Cells (PBMC) in presence or absence of inhibitory sera did not correlate with % inhibition.

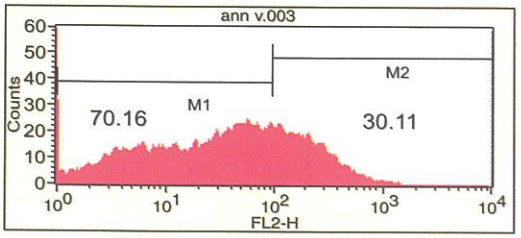
Fig. 1.

INDUCTION OF APOPTOSIS BY INHIBITORY SERA: HISTOGRAM WITH STATISTICS FOR ANNEXIN V STAINING BY FLOW CYTOMETRY



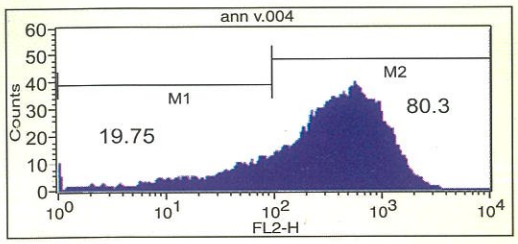
CONTROL WITH 10% AUTOSERA

CPM-308



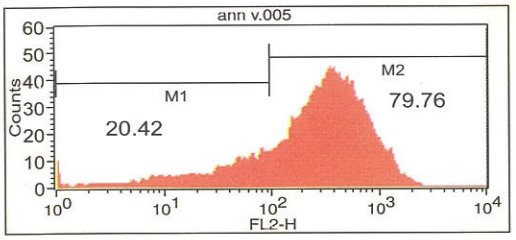
PHA WITH 10% AUTOSERA

CPM-27,315

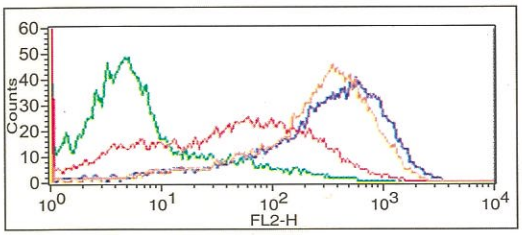


PHA WITH 10% INHIBITORY SERA

(BP-89)
CPM - 1,604

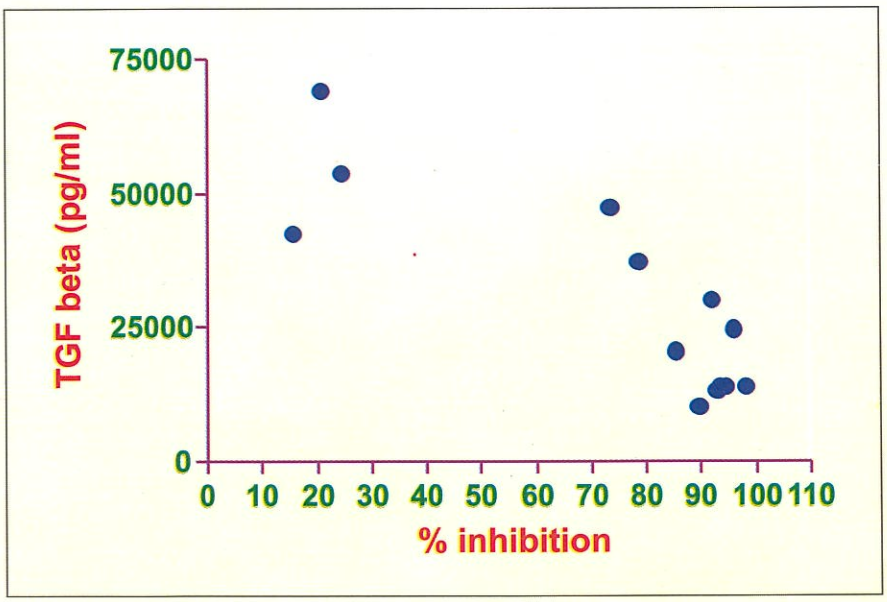


PHA WITH 10% INHIBITORY SERA
(BP-143)
CPM- 469)



OVERLAYED HISTOGRAM

Fig. 2.



On Going Studies

Status :
Extramural (WHO/TDR)

Investigators :
Dr. B. V. Babu, Dr. A.S. Kerketta, Dr. A.S. Acharya, Dr. S.K. Kar

Collaborator :
Prof. D. K. Behera, Sambalpur University

Starting date : July 2003
Closing date : June 2006

1.6 Development and evaluation of community development and partnership strategies for drug delivery for the control of lymphatic filariasis in urban areas of Orissa, India

Background:

Lymphatic filariasis (LF) is a major health problem in many countries of the tropical world. However, recent advances in mapping, diagnostics and development of chemotherapy and monitoring tools have made it possible to plan for the elimination of the disease. The World Health Assembly in 1997 passed a resolution for the global elimination of lymphatic filariasis by the year 2020. India, in its national health policy committed to eliminate LF by the year 2015. Most practical and feasible method of controlling LF is rapid reduction of microfilarial load in the community by annual mass drug administration (MDA) of single dose of diethylcarbamazine (DEC) alone or combination of DEC and albendazole, and it has already been initiated in India. Recently completed ICMR sponsored multi-centric study showed coverages to be far below the expected levels at all study sites. This study was conducted primarily in rural areas and highlighted the need for advocacy and development of better delivery strategies for achieving high levels of coverage. Also the results from Orissa indicated poor compliance in urban areas. Urban areas (vs. rural areas) recorded lower coverage (45% vs. 76%) and compliance rates (23% vs. 49%).

While a drug delivery strategy for rural areas has been developed and is being continuously modified no such strategy exists for drug delivery in urban areas. Bancroftian filariasis is recognized as a disease of urbanization and there is a growing need to develop strategies for drug delivery to achieve high levels of compliance in urban areas. Urban populations also differ from rural populations in several ways. In addition the problem of migration is more pronounced in urban areas than in the rural areas. The higher levels of literacy and economy make these populations more demanding in terms of information and quality of services. Similarly the affluence of some urban communities makes them rely heavily on the private sector for the health needs. More importantly the primary health care system in urban communities lacks the infrastructure and the outreach that is found in rural areas. Thus urban drug delivery strategies, which take into consideration these factors, need to be developed well in time before the mass drug administration strategy is expanded to cover more districts and urban areas including large metropolitan cities.

Hence, the present study has been initiated to develop an innovative strategy to achieve higher coverage of MDA in urban areas. As Phase-1, a formative research has been undertaken to explore and identify opportunities in urban communities, which would help design innovative urban-specific intervention strategy for MDA for elimination of LF. This study has been undertaken in a small industrial town in Orissa, India with a population of around 52000. Various qualitative and quantitative research methods are employed during formative research. The results of formative phase indicated conduciveness for intervention with more community participation and partnership approach. The study also attempted to explore the opportunity for linkages and potential for community strategies with regard to MDA. Stakeholders like community leaders, private practitioners, non-governmental organisations, community-based organisations like women groups and youth groups expressed willingness to participate in activities related to MDA. The data also indicated the need to develop some sub-group specific approaches to achieve higher coverage in MDA. Thus the results of formative research helped to develop a strategy with community participation and partnership approach specific to the urban communities, to achieve higher coverage of MDA. The results of formative research are presented in previous annual report (RMRC Annual Report, 2003-04).

Research questions for intervention:

1. To what extent are communities and potential partners in urban areas aware of filariasis and motivated to participate in MDA?

2. To what extent can the low treatment coverage in urban areas be improved by the application of a strategy that involves stakeholders, especially active CBOs/ NGOs and private practitioners, as equal partners in planning, decision-making and implementation?
3. Can such a strategy significantly enhance the perceived need of, and support for LF treatment among the community, the health workers and the municipality officials?
4. Is effective application of the alternative strategy possible using the existing human resources at the municipality and community level, and if not, what else is required?
5. What level of treatment compliance can be achieved through the application of such an alternative strategy?
6. Is the strategy cost-effective for achieving the required coverage in urban areas (taking also into account the contributions by different partners, including the community)?

Purpose and objectives of the intervention:

Purpose:

To develop and test the partnership strategy for mass drug administration, which would achieve the desired high treatment coverage in urban populations necessary for elimination of LF.

Objectives:

1. To test an intervention strategy that addresses the challenges for MDA in urban areas, building on an inclusive partnership framework developed on the basis of the research findings on the above objective, and involving in particular the private practitioners and active CBOs.
2. To evaluate the impact of this intervention strategy on perceived need of, and in enhancing support for, MDA amongst all stakeholders including the community, health workers, municipal officials.
3. To describe the preparatory and mobilization process as developed by the stakeholders, and to assess its strengths and weaknesses.
4. To describe the drug distribution process as developed by the government in consultation with the stakeholders, and to assess its strengths and weaknesses.
5. To evaluate the treatment coverage (consumption rate) achieved with the new strategy, and to assess whether after three years of intervention it reaches the desired level of treatment coverage with DEC/Alb that is required for elimination of LF.
6. To determine the feasibility of implementation of the new strategy using existing human resources (health and other sectors) at the municipal and community level.
7. To document the contributions made by various stakeholders and to determine the cost of the new strategy.

Study design:

The intervention has been initiated with community participation and partnership strategy to implement MDA. During this phase the researchers acted as facilitators. The existing health system along with municipality and other partners implemented the intervention. The details of intervention and MDA are described in this report. The evaluation is carried out by the researchers. The coverage survey is carried out in a non-intervention urban area and rural area along with intervention urban area.

Study areas:

The intervention is carried out in an urban area, Choudwar. The formative research has been carried out in this area. Choudwar is a municipality area in Cuttack district. Cuttack

is one of the coastal districts of Orissa, which is endemic for LF. Choudwar is situated on the north bank of Birupa River, a branch of river Mahanadi. Choudwar is an industrial area having six major industries and several small-scale industries. However, majority of them have been declared as sick industries and therefore remain closed. As per the Census of India (2001), the population of Choudwar town is 52,498 of which 28,243 (53.8%) are male and 24,255 (46.2%) are female. Of the total population around 55% are workers, which include 28.3% of specifically industrial workers. The health infrastructure of Choudwar is far from satisfactory. Though there is a municipal hospital, the posts of medical officers and many other paramedical have been lying vacant for a long time. The health needs of the industrial workers are being catered by an ESI hospital and an ESI dispensary. Hence, majority of Choudwar's general population depend on private practitioners and hospitals. An NFCP unit exists in Choudwar to undertake antilarval activities and filarial surveys. However, the unit does not function well due to lack of infrastructure and manpower. The people of Choudwar have not been exposed first time to mass drug administration, as Cuttack district did not come under the control programme till then. Choudwar consists of civic body, i.e. municipality to look after the administration of urban communities. The sanitation and public health also come under the purview of municipality. The entire urban area is divided in to 17 wards. The municipality has a constitutionally elected body consisting of a chairman and members. Each ward is represented by a member, i.e. councillor and he is elected democratically from the adult members of the ward.

Various Processes of Proposed Intervention:

Formative research conducted in Phase-1 indicated a conducive atmosphere in the study area for the implementation of mass drug administration (MDA) of diethylcarbamazine (DEC) with the approaches of partnership and community participation. Many health programmes viz., pulse polio programme, leprosy eradication programme, hepatitis control programme, blood donation programmes, AIDS awareness campaigns, etc. are organised in the study area with the help of local communities. Health camps are organised every year by the municipality as well as youth clubs in which people's participation is quite satisfactory. Besides health programmes, some community based organisations (CBOs) have also organised many cultural programmes with the active involvement and participation of people. People of all groups extended their cooperation generously and also there are no major conflicts during community related activities. Implementation of MDA is a government driven programme and municipality is the local government responsible for public health. Though municipality has no such health infrastructure, time-to-time it has conducted many health programmes efficiently with the assistance of local CBOs. Besides during formative research many key informants including doctors, media personnel, members of CBOs, NGOs and local leaders opined that municipality should carry out MDA. The key informants also opined that municipality can provide all logistical support like it has a big town hall with well sitting arrangements and sound system for public propagation, etc. It has also a Filaria unit, which is not functional, but supportive staff is there. Although a well-equipped municipality hospital is not present, it has a dispensary and a pharmacist working there. Taking all these factors into consideration, it was felt that the municipality can play a key role in undertaking MDA in the study area.

Stakeholders' active involvement in planning and decision-making: In this programme, municipality and local health institution played key roles. This body succeeded to include many stakeholders like bureaucrats of municipality, private practitioners, practitioners from other governmental and non-governmental hospitals, community based organizations (CBOs) like youth clubs, women clubs and residence associations, non-governmental organizations (NGOs), journalists, representatives of industries, prison and schools, and representatives of religious and ethnic groups in the program. This newly formed group named as steering committee met periodically. The research team initially advocated for the program to different stakeholders by briefing rationale and benefits of

the program. As facilitators the research team also shared the results of formative research with the steering committee. The steering committee took all decisions on planning including social mobilization and drug distribution. Nominal group technique was used to arrive at a consensus whenever required. However, the committee received some directions and suggestions from the local health institution, which was responsible for providing drugs and other materials.

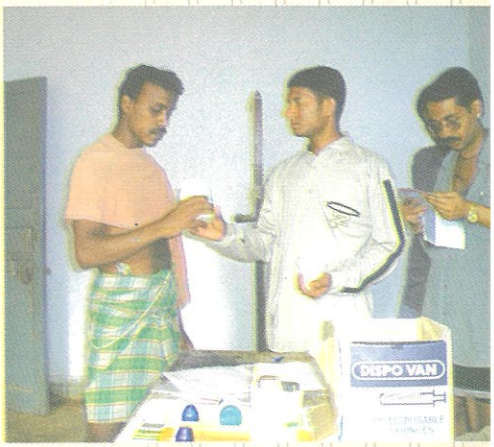
Advocacy: Advocacy was done both among the populations and key partners. This task was performed by the research team for the steering committee and the latter did the advocacy among the local groups. Steps were also taken for the inclusion of new zealous partners and motivating further the existing stakeholders. The steering committee undertook this activity among the community groups.

Initiating the intervention: Having designed the plan for the entire urban area, the steering committee identified ward level partners, who are suitable to undertake activities related to community mobilization and drug distribution. The strengths and weaknesses of these groups were assessed by the steering committee and necessary inputs were given. In most of the wards (15 out of 17 wards), the concerned councillors led the ward level activities. In the remaining two, a social worker and a former councillor did the same. The ward level groups met before the MDA and made suitable plans for their ward, through an intensive profiling process.

Partnership: Thus the partners were involved in various stages of intervention. Also some of the stakeholders got involved in the social and economic mobilization. The micro-level planning (methods of MDA, date, time, duration, selection and training of community drug distributors, etc.) at the municipality and ward level were made by the steering committee and the ward level committee, respectively. A few medical practitioners from the steering committee were grouped into four teams for adverse reactions surveillance and management as an integral part of the distribution process. The basic objective was to minimize the damage expected during drug distribution and enhance people's confidence on the program. In addition, different sub-groups were identified for the separate differential treatment (Box-1).

MDA: The strategy ultimately resulted in local decision-making in consultation with health institution with regard to execution of drug distribution. The following were the major components in MDA.

- **Selection and training of community drug distributors (CDDs)**: The ward level committee identified some local volunteers, designated as CDDs, to distribute the drugs. Each CDD was given charge of a geographical area consisting of population around 400. Some para-medical staff of the local health institutions were included as supervisors to monitor the MDA process. The CDDs and supervisors underwent one-day training, organized by local health institution with the help of the steering committee.
- **Drug distribution**: The distribution process initiated on the morning of September 15, 2004, as planned jointly by the steering committee and ward level committee. The distribution was carried out by the CDDs either individually or in groups. In some wards, the members of steering committee, particularly the councillors and members of ward level committees, monitored the activities. The supervisors monitored the activity of drug distribution and assisted the adverse reactions management team by identifying cases along with the CDDs. The distribution process continued subsequently for three more days, but adverse reactions management teams did not conduct mobile operation during those days due to practical exigencies. However, the CDDs, supervisors and ward level committees were directed to bring such cases to respective hospitals of these physicians.



Community drug distributor during MDA under RMRC intervention

Information framework adopted for evaluation:

Objectives	Variables	Source	Methods
(1) To test an intervention strategy that addresses the challenges for MDA in urban areas, building on an inclusive partnership framework developed on the basis of the research findings on the above objective, and involving in particular the private practitioners and active CBOs.	Coverage Compliance Reasons for low/high coverage and compliance Feasibility (willingness to repeat)	❖ Community members ❖ Government and municipality staff ❖ Other stakeholders	❖ Quantitative household surveys ❖ Process evaluation ❖ In-depth interviews
(2) To evaluate the impact of this intervention strategy on perceived need of, and in enhancing support for, MDA amongst all stakeholders including the community, health workers, municipal officials	Perceived need of MDA **Community, Health personnel/ Municipal officials:** ▪ Possible increase in knowledge level ▪ Risk perception will increase across strata ▪ Fewer conflicts ▪ Attitude towards MDA may change ▪ More involvement of people ▪ More demand for MDA, information ▪ Drug distribution and treatment coverage rates ***Enhancing support for MDA*** **Community:** ❖ Mobilization of resources – manpower, material, logistics	1. Community members 2. Key-informants in the community 3. Stakeholders including health/municipality personnel, NGOs, CBOs, etc.	4. Focus groups discussions 5. In-depth interviews 6. Quantitative household surveys

	❖ Demonstrate through proactive action (CBOs/NGOs) ❖ Liaison with other sectors for infrastructure support **Health workers/municipal officials:** ❖ Allocation of more time and resources (physical and human, IEC) ❖ Inclusion of LF in the priority list of diseases ❖ Initiating involvement of local political leaders for creating political will ❖ Disseminating information to media ❖ Maintaining liaison with concerned professional associations ❖ Creating/supporting a system for surveillance and management of issues related to MDA		
(3) To describe the preparatory and mobilization process as developed by the stakeholders, and to assess its strengths and weaknesses	❖ List of preparatory and mobilization processes and suggested strategies for the completion of those processes ❖ Stock of the suggested preparatory and mobilization processes at different levels (such as strata, sub-group, ward and municipality levels) ❖ Scope of involvement of various local talents and resources in the draft plan for mass mobilization ❖ Peoples' responses and their suggestions for mass mobilization ❖ Assessment of the draft preparatory and mobilization processes on the basis of the responses of the stakeholders and the general mass ❖ Passing on the feedbacks to the coordinating committee for required alterations or modifications in the strategies and arriving consensus by nominal groups technique (NGT)/ modified Delphi	❖ Different stakeholders ❖ Documentation of the preparatory process using audio-video equipments ❖ Documentation of the mobilization process ❖ Concurrent evaluation and passing of the feedbacks to different groups of stakeholder	❖ Formal and informal discussions ❖ Process documentation ❖ Process evaluation ❖ In-depth interviews
(4) To describe the drug distribution process as developed by the government in consultation	❖ Stages of drug distribution ❖ Possible inclusion of other potential partners in DDP (e.g. like private practitioners)	❖ Recording drug distribution process ❖ Cross-checking of	❖ Process recording ❖ Process evaluation ❖ In-depth interview with

with the stakeholders, and to assess its strengths and weaknesses	❖ Assessment of the nature of participation of different categories of the stakeholders in developing DDP ❖ Critical assessment of the variation (possible positive and adverse impacts) ❖ Cultural constraints by different categories of stakeholders ❖ Time and place of drug distribution ❖ Selection of drug distributors ❖ Training of drug distributors ❖ Importance of strata and sub-groups in the process of drug distribution (to be ascertained by the coordination committee with the help of the researchers) ❖ Recording of regional peculiarities and possible cultural constraints (to be done by the members of the concerned groups) and incorporating sub-strategies for countering such constraints (to be done by the coordination committee in consultation with the concerned groups) ❖ Meetings with private practitioners/ and at the associational level and involving them as partners in evolving new strategies ❖ Suggestions of the private practitioners on possible constraints on the medical and socio-cultural dimensions ❖ Assessment of the participation of the marginalized/vulnerable groups in drug distribution process	inclusion of suggestions on the basis of research findings ❖ Views of the stakeholders on the weakness of the suggested DDP ❖ Argument of the stakeholders in favour of adaptation of a new sub-strategy/minor modification of the suggested strategies of DDP (Nominal group technique)	stakeholders
(5) To evaluate the treatment coverage (consumption rate) achieved with the new strategy, and to assess whether after three years of intervention it reaches the desired level of treatment coverage with DEC/Alb that is required for elimination of LF	❖ Quantitative assessment of the drug coverage and compliance strata, sub-group and ward wise ❖ Analysis of coverage and compliance across the strata ❖ Reasons for low/high coverage and compliance ❖ Cross examining the effectiveness of the suggested sub-strategies for different sub-strata ❖ Critical assessment of the strength and weakness (i) Why a few sub-strategies did not yield the expected results? (ii) Why some of the strategies worked well?	❖ Community members, including sub-groups ❖ Government and municipality staff ❖ Other stakeholders	❖ Quantitative household surveys ❖ Process evaluation ❖ In-depth interviews ❖ Focus group discussions with sub-groups

(6) To determine the feasibility of implementation of the new strategy using existing human resources (health and other sectors) at the municipal and community level	❖ How leaders / CBOs in the community were identified, selection criteria used, meetings held, training / sensitisation sessions of CBOs, agenda discussed ❖ Number of committees formed at different levels? ❖ Number of leaders, CBOs per ward who participated in the MDA ❖ Number of meetings held for planning, and implementing MDA ❖ Role of health worker / non-health worker in the above ❖ How was the above different across strata/sub-groups ? ❖ IEC campaign details, IEC materials used, involvement of CBOs in IEC campaign ❖ Number of drug distributors, from health services, from community, from CBOs etc. ❖ How were side effects managed, systems for surveillance of side effects ❖ Number of private practitioners, professional associations who participated in planning and implementation of MDA ❖ Number of patients with side effects managed by private practitioners ❖ Role of private practitioners in implementing MDA – advising people, dispensing DEC – across strata ❖ difficulties in the above processes	❖ Municipality and health personnel ❖ private practitioners ❖ All other stakeholders including CBOs	❖ In-depth interviews ❖ Focus group discussions
(7) To document the contributions made by various stakeholders and to determine the cost of the new strategy	costing per ward (additional costs incurred for involving partners) – direct costs + additional costs for human resources ❖ costs for meetings ❖ opportunity costs for volunteerism ❖ costs for training, IEC material distributed ❖ # of hours spent ❖ costs for CME for doctors ❖ incentives for drug distributors etc.	❖ Municipality and health personnel ❖ All Stakeholders at all levels	❖ Structured questionnaire survey

On Going Studies

Sampling:

The intervention and MDA are implemented in entire municipal area of Choudwar. For evaluation of intervention, following sampling frame is employed.

Strata: For sampling purpose, the urban wards are divided into four strata, i.e., high-income group (HIG), middle-income group (MIG), low-income group (LIG-1) and slums (designated as LIG-2). HIG wards are those having more than 60% of HIG houses. The same principle is applied for the identification of MIG and LIG-1 wards. The list of slums is obtained from the municipality authorities, to identify LIG-2 areas.

Selection of households from HIG, MIG and LIG-1 strata: After categorizing all the wards into HIG, MIG and LIG-1, two wards are selected from each stratum on a random basis. Having listed all colonies/streets in a ward, five colonies/streets are selected on a random basis. In each colony/street, a random point is selected and from there ten consecutive households are selected for various surveys.

Selection of households from slums: The lists of wards containing slums are prepared on the basis of information obtained from the municipality. From the compiled list, 10 slums/ hutments are selected on random basis. From each area, 10 households are selected consecutively.

Quantitative and qualitative approaches:

Both quantitative and qualitative data collection techniques are used during the evaluation as shown in the above table. The quantitative data on coverage, compliance and related issues are obtained through household questionnaire survey. All the sample households from four strata are included for household questionnaire survey. For comparison purpose, the household coverage survey has been undertaken in a neighbouring urban area, namely Dhenkanal, where no intervention has taken place. This town is comparable in population and other physical and demographic features and MDA has been undertaken as usually by the government. Similarly another rural area has been selected for this survey. The coverage and compliance are compared across these areas, i.e. intervened urban area, non-intervened urban area and non-intervened rural area. The qualitative techniques used are focus group discussions (FGDs), in-depth interviews and free listing. All these surveys are taken equally from all strata. FGDs are conducted among members of youth club, members of women group, general community and sub-groups in the community. In-depth interviews with various respondents including the partners of intervention (like councillors, community leaders, private practitioners, paramedical professionals, media persons, representatives of CBOs and NGOs, etc.) are conducted. Key-informants from each stratum, who specifically represent the stratum are sampled and interviewed. In addition, some key- informants who represent the entire town are selected. Few case studies are recorded in order to narrate high level of people's participation and high coverage of MDA. Free-listing has been done to assess the change in the people's priority, with regard to LF.

Details of surveys

Particulars of survey	Sample
Household coverage survey	
From Intervened urban area	4835
From non-intervened urban area	1218
From non-intervened rural area	1145
Post intervention KAP survey	402
Key-informant interviews	36
In-depth interviews with partners	19
In-depth interviews with drug distributors	40
In-depth interviews with supervisors of distribution	4
Focus group discussions with community members	15
Free-listing	122
Case studies	2

Data processing and analysis

Quantitative data: The quantitative data collected through household coverage survey were processed and analysed through SPSS. V.10. For open-ended questions, particularly on reasons for non-reception and non-compliance of drugs, adverse reactions, etc., equivalent narrations were pooled in to different categories during analysis. The significance of differences in their indicators is assessed by Z-test.

Qualitative data: All the FGDs and in-depth interviews were undertaken in Oriya, the local language of Orissa. The entire discussion/interview was recorded on audiocassettes. At the end of the discussion/interview, the audiocassettes were played back and transcribed in to Oriya with the help of field notes. The scripts were translated to English. These scripts were entered in to personal computer in MS Word as text files. The analysis is being done by using ATLAS/ti for Windows V.4.1. Three indicators namely coverage (percentage of eligible people who received tablets), compliance (percentage of eligible people who swallowed tablets) and household coverage (percentage of households visited by CDDs or health workers (in non-intervention area) during MDA were used to evaluate the outcome of intervention. The free-listing data will be analysed by using Anthropac.

Results of Intervention:

The quantitative data obtained through household coverage survey and post KAP survey are analysed and the results are given. The results of coverage survey indicated that the intervened urban area recorded significantly high coverage ($p<0.001$) and compliance ($p<0.001$) and household coverage ($p<0.001$) than that of non-intervened urban area, but nearer to that of the non-intervened rural area (Table 1 and Fig. 1). The household coverage data indicate the efforts of drug distributors in reaching the households. In intervened urban area it is similar to rural areas, where there is network of health workers and health workers cover all corners of the village. In intervened urban area, the CDDs could reach

to maximum number of households. The difference between coverage and compliance, i.e. the group of individuals who have not consumed the tablets, though they received is

Table 1. ***Coverage and compliance in intervened and non-intervened area***

Area	Group	Sample size	Coverage	Compliance
Intervened urban area	Male	2540	92.3	71.3
	Female	2295	91.9	73.2
	Total	4835	92.1	72.2
Non-intervened urban area	Male	612	69.3	38.9
	Female	606	68.2	43.4
	Total	1218	68.7	41.1
Non intervened rural area	Male	596	91.6	70.8
	Female	549	91.6	73.0
	Total	1145	91.6	71.9

still high in all groups. However, this number is more in non-intervened urban area (27.6%), than intervened urban area (19.9%) and non-intervened rural area (19.7). The reasons for both compliance and non-compliance are collected through coverage survey as well as through some ethnographic methods. The analysis of these data gives clue for existence of high numbers.

The age-wise rates of coverage and compliance in study area are given herewith (Fig. 2). There are no significant variation either in coverage and compliance among individuals of above 4 years old. But there are significantly low levels of coverage and compliance reported among children below 5 years. This is due to perception of parents that the age of the children is too young to receive drugs and also the fear of adverse reactions.

Fig. 1. Coverage, compliance and household coverage rates among intervened urban, non-intervened urban and rural areas

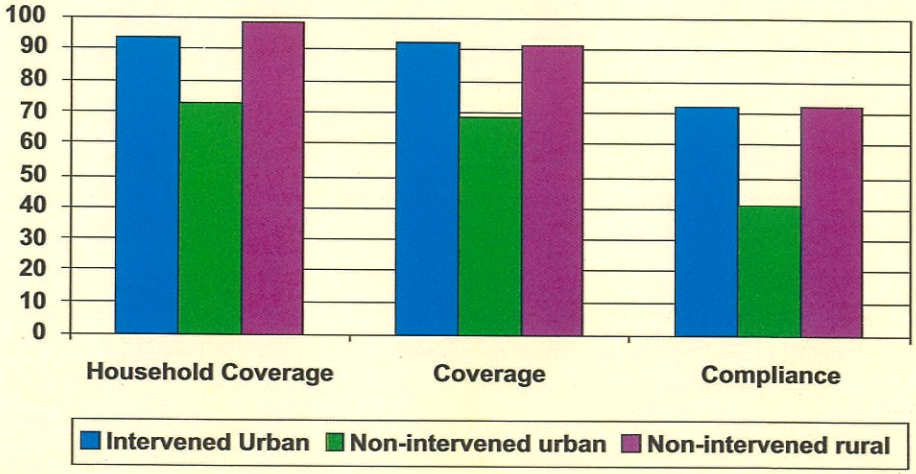
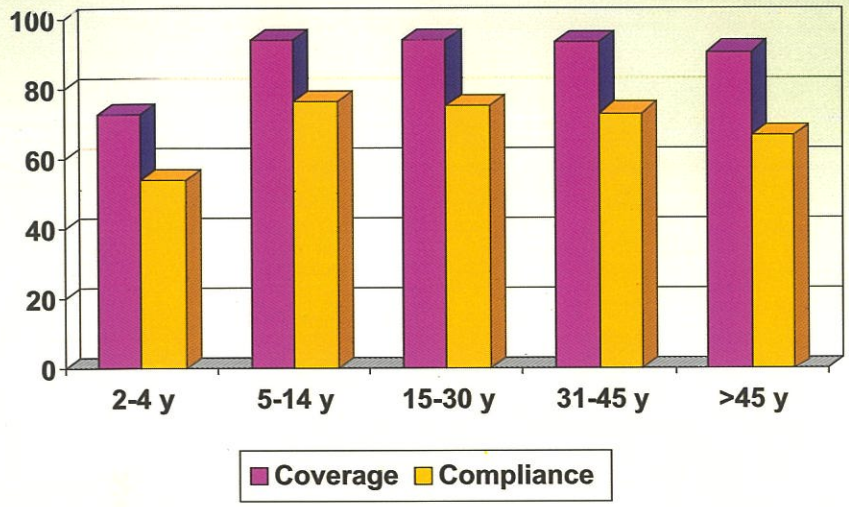
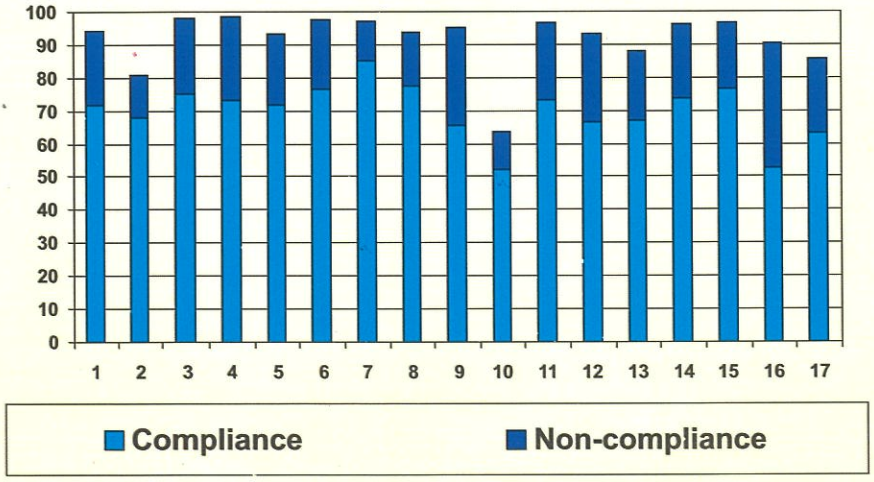


Fig. 2. Coverage and compliance among individuals of different age groups in intervened urban area



The variations in coverage and compliance across various wards of study area are noticed and shown (Fig. 3). Of all the wards, 10th ward reported the lowest coverage and compliance. The gap between coverage and compliance also varied across these wards. The reasons are to be obtained carefully from qualitative data. It is attempted to correlate the features of wards as well as the performance of ward level activities with coverage and compliance rates.

Fig. 3. Coverage, compliance and household coverage rates among intervened urban area



The qualitative data are to be analysed. The qualitative data will be analysed with the background of low and high rates of coverage and compliance, to unveil the motives to achieve high compliance and reasons for low compliance. Also the data is being critically examined to improve and implement the strategy in coming round of MDA. The key findings based on the preliminary data analysis are shown in Box-2.

On Going Studies

Sidebars

Box-1 SPECIAL STRATEGIES	Box-2 KEY FINDINGS

• **Sub-group approach**: While dealing the following sub-groups during community mobilization and drug delivery, special strategies were adopted for their acceptance in order to achieve more compliance.
  • Religious minorities
  • Linguistic minorities
  • Prisoners
  • School/college students
• **Use of local practitioners**: The services of local practitioners including private practitioners and physicians from industry hospitals were utilized during management of adverse side reactions, and ward level community mobilization activity.
• **Sensitisation of media personnel**: Through a process of mobilization, media personnel were requested to highlight the positive aspects of the program ignoring the bare instances of some adverse reactions at the time of reporting. For achieving their support, some of them were made members of the steering committee.
• **Communication and community mobilization activities**: Intensive community mobilization activities (e.g., rallies by school children and house-to-house visits) were organized by involving different partners during the period of environment building. Various IEC materials also were used.
	• Partnership approach involving various stakeholders is an innovative alternative method for addressing the problem of low MDA coverage and compliance in urban India.
	• The MDA with local decision-making and local leadership is quite effective in urban communities.
	• This innovative approach has potentiality to achieve desired levels of results in different strata of urban communities.
	• It takes into account the specificity of the situation and thereby tries to address the socio-cultural peculiarities of different sub-groups.
	• Seems to be suitable for implementation in other urban areas.

1.7 Malariogenic stratification of Anugul district of Orissa using sibling species prevalence of malaria vectors

Status :
Intramural

Investigators :
Dr. N. Mahapatra,
Dr. R.K. Hazra,
Dr. S.K. Parida;
Mr. N.S. Marai,
Mr. H.K. Tripathy.

Starting date :
October 2003

Closing date :
September 2005

Objectives:

1. To study the prevalence of different sibling species complex of malaria vectors and their susceptibility status to insecticides in Anugul district of Orissa.
2. To study the bionomics of the complex like resting, feeding and biting behaviour, anthropophilic indices, gonotrophic cycle, and preferential breeding habit.
3. Malariogenic stratification of the district basing on the above parameters

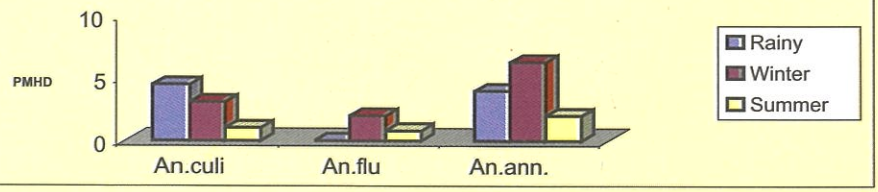
Results:

The distribution of vectors, their species complex and its biological adaptation and residence in particular environment is the determining factor in establishing malaria endemicity. Anugul district has eight PHCs having a total population of 11,39,341 (Census of India, 2001). The district possesses forest, riverine and plain ecotype and it has also developmental dam project area as well as mining area. Three out of eight PHCs, viz. Bantala, Godibandh and Kaniha, representing each ecotype, were selected for entomological studies. From each PHC, 6 representative villages were selected based on different ecotypes (Hilly forest-2, Plain-2 and riverine-2). Each PHC was visited once in all the three seasons i.e rainy, winter and summer. Each village possesses about 100 houses on an average. Mosquitoes were collected from 10% of the households (HD) and 10% of the cattle-sheds (CS) from each village. The sampling for all the entomological studies were done as per the WHO procedure (WHO, 1975). After collection, the mosquitoes were identified. Blood meals were collected on Whatmans filter paper for processing by gel diffusion technique. The ovaries were dissected from semigravid females and were placed in modified Cornoy's fixative. Ovaries were processed in 50% propionic acid and stained in 2% lacto- aceto-orcein according to the method of Green and Hunt (1980) for making polytene chromosome preparation. The chromosomal preparations were studied under phase contrast microscope.

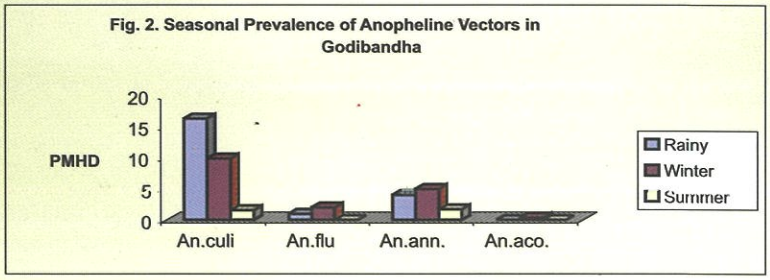
The entomological study reveals the presence of 13 species of mosquitoes belonging to four genera, i.e. *Anopheles, Culex, Aedes* and *Armigeres. Anopheles* species collected were *An. aconitus, An. annularis, An. culicifacies, An. fluviatilis, An. hyrcanus, An. maculatus, An. pallidus, An. pseudojamsei, An. Subpictus, An. splendidus, An. tessellatus, An. vagus and An. Varuna.*

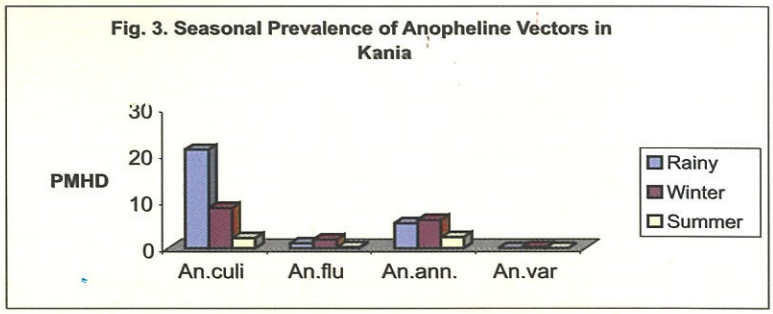
The prevalence of the three main vectors in different PHCs during winter, summer and rainy seasons are depicted in Fig.1-3. The density of *An. culicifacies* was highest during rainy followed by winter and summer while *An. fluviatilis* was collected more in winter in all the PHCs. *An. annularis* was predominant during winter followed by rainy season.

Fig.1. Seasonal Prevalence of Anopheline Vectors in Bantala



On Going Studies





An. culicifacies, An.fluviatilis and *An. annualris* are found to be the main vectors in Anugul district. Out of five sibling species of *An.culicifacies (A,B,C,D, & E),* species B and C and from three sibling species of *An. Fluviatilis (S,T &U)* only S and T were collected from the district. *An culicifacies* B and C and *An fluviatilis* T were found in all the PHCs. The percentage of *An. culicifacies* C were 80 %, 55% and 70% in Bantala, 85%, 68%, and 75% in Godibandh and 78%, 65% and 72% in Kaniha PHC during rainy, winter and summer seasons respectively(fig 5-7).

Molecular identification of *An.fluviatilis* was also done. In the molecular analysis the D3 region of the ribosomal DNA were analyzed using primers developed by MRC (Singh *et al.*, 2004)(Fig -4). The result of the molecular study revealed the composition of *An. fluviatilis* S were 78 % , 88%and 50% in Bantala PHC and 75%, 98% and 66% in Kaniha PHC during rainy, winter and summer seasons respectively. In Godibandh PHC, all the *An. fluviatilis* collected were found to be only *An. Fluviatilis* S (fig 8-9). One specimen of *An. fluviatilis* U was collected from Bantala PHC.

Fig. 4. Molecular analysis of An. fluviatilis

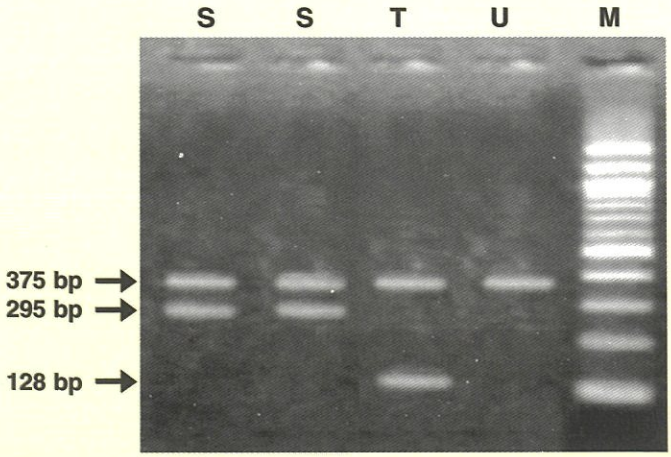


Fig. 5. Prevalence of Sibling Species Complex of *An.culicifacies* in Kania

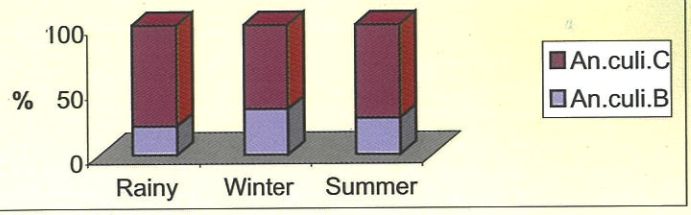


Fig. 6. Prevalence of Sibling Species Complex of *An.culicifacies* in Bantala

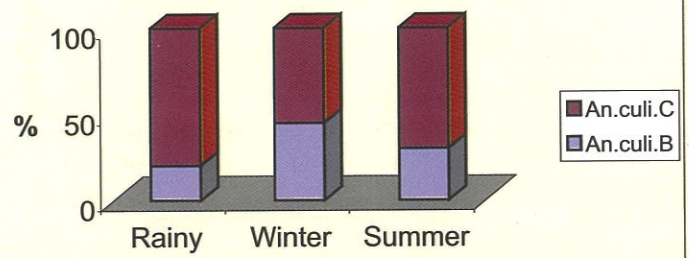


Fig. 7. Prevalence of Sibling Species Complex of *An.culicifacies* in Godibandha

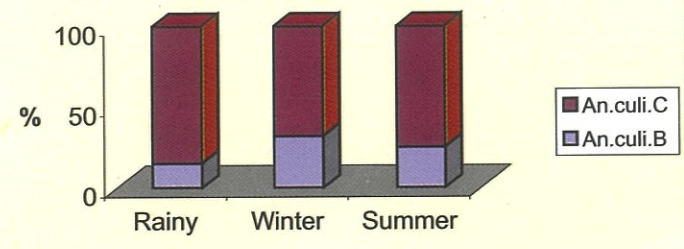
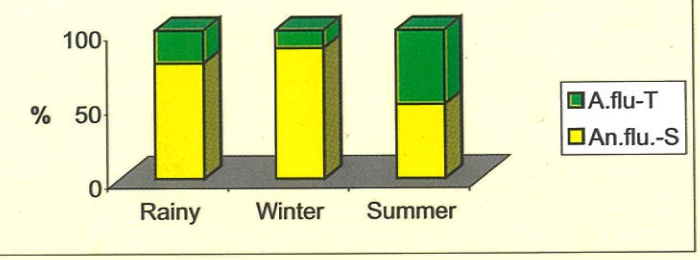


Fig. 8. Prevalence of Sibling Species Complex of *An.fliviatilis* in Bantala



On Going Studies

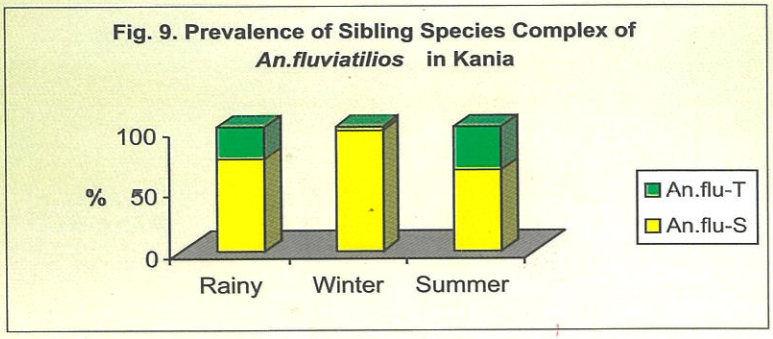


Fig. 9. Prevalence of Sibling Species Complex of *An.fluviatilios* in Kania

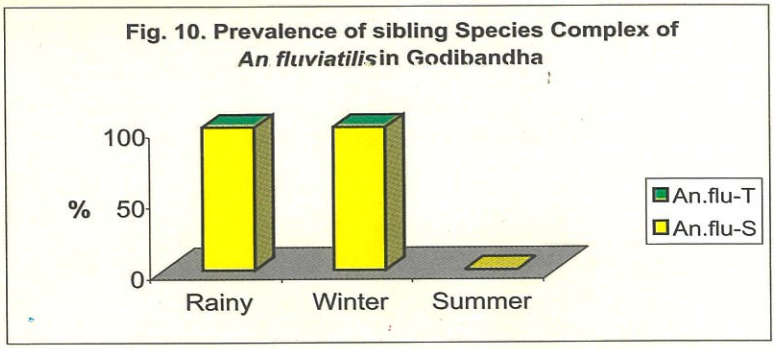
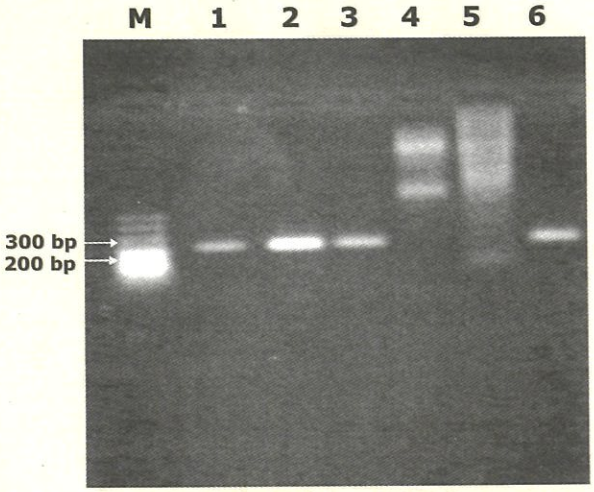


Fig. 10. Prevalence of sibling Species Complex of *An fluviatilis* in Godibandha

Detection of sporozoite:

Detection of sporozoite was done in 256 anopheline mosquitoes by dissection and in 327 anophelines by PCR method (Snounou *et al.*, 1993). Two specimen of *An. Culicifacies (*one from Kaniha and one from Godibandh*)* and one species of *An.annularis* (Kania) were found positive for *P.falciparum* sporozoite by PCR method (Fig-11). The sporozoite rate by PCR method was found to be 0.9 % and the sporozoite rate by both the methods is 0.5%. (Tab-1)The work is in progress.

Fig.11. Detection of sporozoite by PCR method in Anopheline



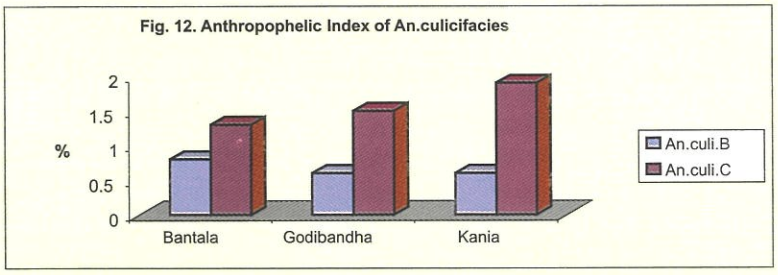
Lane M: 100 bp ladder, Lane 1&2 test samples *An. culicifacies* and 3 to 5 test samples of *An.annularis* Lane 6 : Positive Pf sample

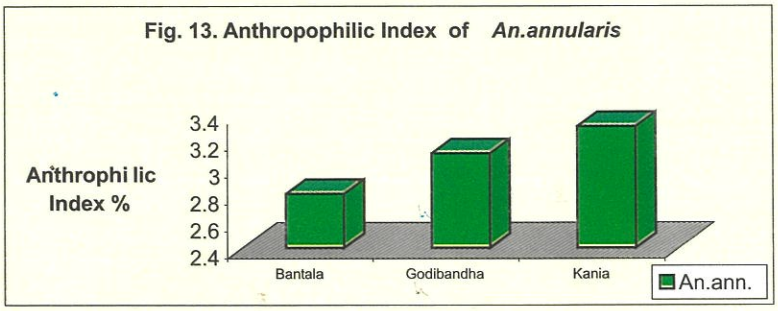
Table 1. Sporozoites detection

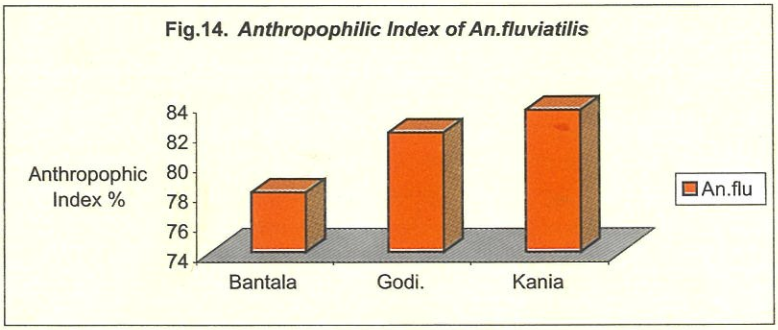
SL. No.	Anopheline Species	Number dissected	Number positive for sporozoites	PCR detection	
				Number tested	Number positive
1	*An.culicifacies*	118	0	160	2
2	*An.annularis*	123	0	154	1
3	*An.fluviatilis*	4	0	5	0
4	*An.varuna*	8	0	4	0
5	*An aconitus*	3	0	4	0
	Total	**256**	**0**	**327**	**3**

Precipitin test:

Precipitin test was conducted for the identification of source of blood meals of anopheline vectors by using gel-diffusion technique. *An. fluviatilis* was found to be highly anthropophilic (>75%) where as *An. culicifacies(>97%)* and *An. annularis (>96%)* were highly zoophilic (Fig12-14).







On Going Studies

Susceptibility Test:

The susceptibility status of *An.culicifacies* B and C was done and it was observed that both B and C are resistant to DDT but they are susceptible to Deltamethrine 0.5%.

Though two sibling species reported in *Anopheles annualris*, the presence of species complex in Orissa is unknown. We have started the detection and identification of sibling species of *An. annualris*, which also plays an important role in malaria transmission. Molecular methods for identification of sibling species work initiated with standardization of D3 and ITS2 region.

1.8 Development of potent mosquitocidal agents from natural sources

Status : Extramural (ICMR)
Investigators : Dr. N. Mahapatra, Dr. R.K. Hazra, Dr. S.K. Parida
Collaborator : Dr. U.V. Mallavadhani (P.I.) Regional Research Laboratory (CSIR), Bhubaneswar
Starting date : March 2005
Closing date : February 2007

Objectives:

1. Identification, collection and extraction of potent natural sources (terrestrial plants, mushrooms, high altitude taxa like lichens, orchids and ferns.
2. Generation of abundantly available natural products and analogues.
3. Mosquitocidal screening of the natural sources and natural products/analogues against mosquito vectors, *An. stephensi* (malaria), *Cx. Quinquefasciatus* (filariasis), *Ae.aegypti* (dengue).
4. Development of potent natural mosquitocides

Work Progress:

Preliminary work was done before funds released in the month of July.

Procedure for collection and extraction of natural sources (carried out by RRL):

Natural sources such as plants, Lichen, mushrooms, etc. were collected from outlocation and wild sources. Species were identified .The collected plant products were washed with fresh water, shed dried and powdered in pulverizer. The powder sources material were packed in soxhlet extractor and extracted with various polar and nonpolar solvent such as n-Hexane, Ethylacetate and Methanol. Concentrations of these extracts under reduced pressure yeilded the respective residues. These residues are then screened for mosquitocidal activity. Initially methanol, chloroform, ethylacetate and water soluble extract of Cinnamon species and methanol and ethylacetate extract of Euphorbia and Dispirus species were supplied by RRL for screening for mosquitocidal activity.

Bioassay test:

The bioassay test of the plant extracts were carried out in the laboratory condition against the 3 species of mosquitoes viz., *An.stephensi (vector of malaria), Ae.aegypti* (vector of dengue) and *Cx.quinquefasciatus (vetor of filariasis)* following standard WHO procedure (WHO, 1981) . A known amount of the extract were dissolved with a known volume of solvent to give the stock solution, appropriate amounts of which were added separately to 100 ml of water in 500 ml beakers to give different test concentration (0.01 to 1ppm). Each concentration was replicated five times. After addition of the test material, the water were stirred vigorously and left for about 30 minutes for evaporation of the solvent. Around 15 healthy laboratory bred late 3rd instar larvae were released into each beaker for assay. The mortality and behaviour of the larvae were observed. A pinch of yeast tablet were given into each beaker or tray for feeding the larvae. The observations were made till all the larvae in the control beaker emerge to adult.

To start with 0.01ppm to 0.1ppm of methanol, chloroform, ethylacetate and water soluble extract of Cinnamon species and methanol and ethylacetate extract of Euphorbia and Dispirus species were tested against An.stephensi, Cx.quinquefasciatus and Ae.aegypti. No mortality was observed in any of these concentrations. The test concentration was increased (0.1 to 1 ppm). Ethylacetate extract of Euphorbia did not show any mortality upto1ppm against all the three species tested. (Table 1). Water soluble extract of Cinnamon showed 73.3% mortality at 0.4 ppm against *Cx. quinquefasciatus*. (Table 1-2). The study is in progress.

Table 1. Bioassy test result of Methanol extract of Euphorbia

Species	Concentration	No.of larvae tested	Mortality after 24 hrs	Mortality after 48 hrs.
Cx. quinquefasciatus	0.1ppm	75	Nil	Nil
	0.2ppm	75	Nil	Nil
	0.4ppm	75	Nil	Nil
	0.6ppm	75	Nil	Nil
	0.8ppm	75	Nil	Nil
	1 ppm	75	Nil	Nil
	Control	75	Nil	Nil
An.stephensi	0.1ppm	75	Nil	Nil
	0.2ppm	75	Nil	Nil
	0.4ppm	75	Nil	Nil
	0.6ppm	75	Nil	Nil
	0.8ppm	75	Nil	Nil
	1 ppm	75	Nil	Nil
	Control	75	Nil	Nil
Ae.aegypti	0.1ppm	75	Nil	Nil
	0.2ppm	75	Nil	Nil
	0.4ppm	75	Nil	Nil
	0.6ppm	75	Nil	Nil
	0.8ppm	75	Nil	Nil
	1 ppm	75	Nil	Nil
	Control	75	Nil	Nil

Table 2 : Bioassay Test Result of Plant Extract against *Cx. quinquifasiatus*

Species	Concentration	No.of larvae tested	Mortality after 24 hrs	Mortality after 48 hrs.
Water extract of Cinnamon	0.1 ppm	75	10	1
	0.2ppm	75	12	2
	0.3ppm	75	18	4
	0.4ppm	75	55	5
	control	75	Nil	Nil

1.9 Studies on prevalence of 76Tcrt / 86Ymdr1 Plasmodium falciparum isolates in severe malaria cases of Orissa and its biological advantage.

Status : Intramural

Investigators : Dr. M.R. Ranjit, Dr. G.P. Chhotray

Starting date : April 2005

Closing date : January 2005

Objective:

1. To investigate the prevalence of 76Tcrt / 86Ymdr1 Plasmodium falciparum isolates in severe malaria cases of different geographical regions of Orissa.
2. To test the drug sensitivity pattern of these isolates by in-vitro assay.

On Going Studies

3. To study the multiplication pattern of these isolates in different blood groups

Progress:

Since the PI was on study leave upto January 2005, the project has been initiated from February 2005 after the Ethical committee approval. During this period total 55 blood samples (23 severe and 31 uncomplicated) has been collected from SCB Medical College & Hospital, Cuttack for genomic analysis. The genomic DNA has been isolated by phenol extraction and ethanol precipitation. The PfCRT (K76T) and PfMDR1 (N86Y) point mutations were analyzed by PCR-RFLP. The initial result reveals that a significantly higher ($P<0.005$) number of severe cases (n=11, 47.8%) harbours the CQ resistance markers than the uncomplicated cases (n=4, 12.9%). This indicates that the maximum number of severe malaria in the state may be associated with treatment failure.

1.10 Study on nutritional status of Dongria Kondh primitive tribe and Domb scheduled caste populations of Orissa.

Status : Extramural (ICMR-Taskforce)

Investigators : Dr. G. Bulliyya, Dr. B. Dwibedi, Mrs. G. Mallick

Starting date : July 2003

Closing date : June 2005

Objectives:

1. To study demography, socio-economy and morbidity status;
2. To assess the nutritional status of all age groups;
3. To study the household food and nutrient consumption patterns and seasonal variation;
4. To evaluate the availability and utilization of health care and nutritional programmes;

Work progress:

Field works have been conducted in three revenue blocks namely Muniguda, Kalyansighpur and Bissam Cuttack in Rayagada district. Household on demography, socio-economy, utilization of healthcare services, knowledge-attitude practices on health and nutrition were collected from 210 households (165 Dongria PTG and 45 Domb SC). Diet survey was carried out among 155 households and nutritive values were calculated using nutritive values of Indian foods.

Nutritional status of preschool children was assessed according to weight-for-age (underweight), height-for-age (stunting) and weight-for-height (wasting) using SD classification and NCHS standards (Fig 1). The prevalence of underweight (weight-for-age <median-2SD), stunting and wasting was 69%, 62% and 38% respectively among Dongria, while it was relatively lower among Domb children. The proportion of severe grades of underweight and stunting is observed to be marginally higher for girls. The proportions of children by weight-for-height are in the order of grades of normal (62.2% and 71.7%), wasting (27.0 and 20.8%) and severe grade of wasting (10.8 and 7.5%) in both the population groups.

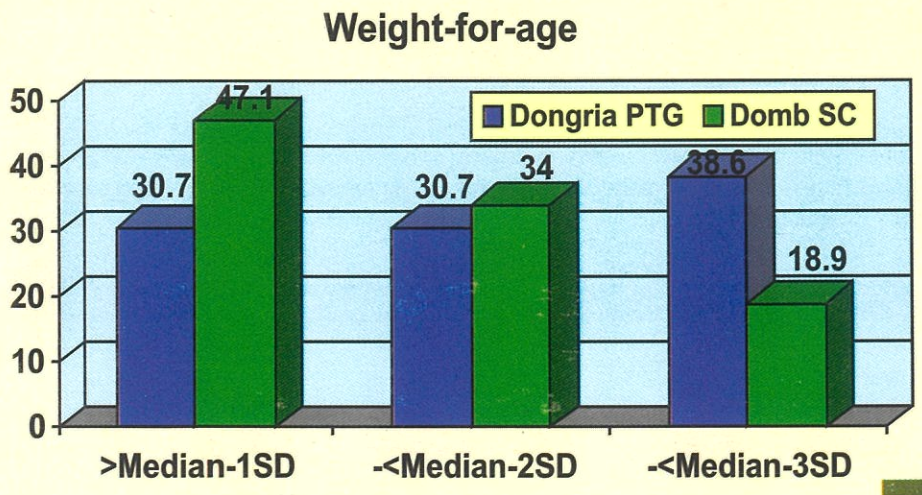
The nutritional status of adults aged over 20 years assessed according to body-mass index (BMI). The prevalence of chronic energy deficiency (CED-BMI<18.5 kg/m^2) was about 60% for both Dongria Kondh and Domb populations, while about 30% and 10% were having

below normal and normal BMI. Less than one percent of these populations were overweight or obese (BMI>25 kg/m^2). The prevalence of grade III CED (BMI<16 kg/m^2) was greater in Domb SC (17.6%) than in Dongria (13%) populations. About 10% of adults were normal in both the study groups. The prevalence of CED among males was relatively higher for both the groups (Fig 2).

Anaemia status of study populations was assessed using the WHO cut-off values of age and sex specific groups using haemoglobin levels (Fig 3). The prevalence of anaemia was 86.4% and 76.9% among Dongria Kondh and Domb populations respectively. The proportion of mild, moderate and severe grades of anaemia was 42.2%, 28.5% and 15.7% respectively for Dongra Kondhs, while it was 36.9%, 28.2% and 11.8% for Domb scheduled caste population. The extent of mild and moderate degrees of anaemia was higher in Dongria Kondh tribal group as compared to Domb scheduled caste population.

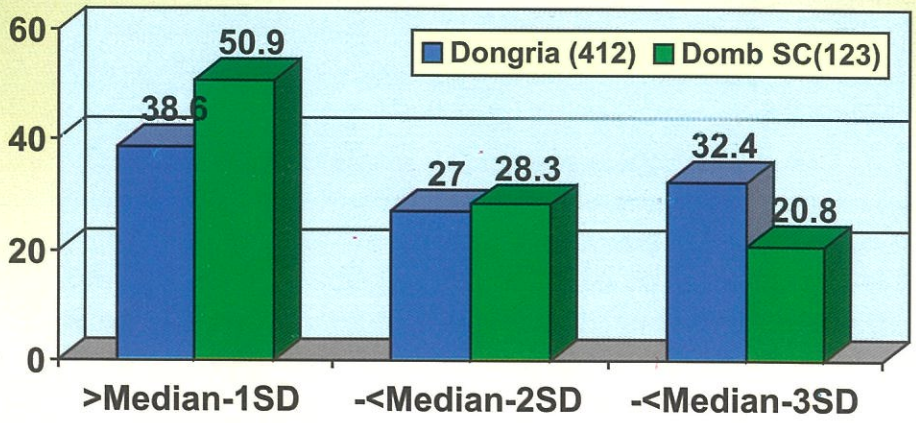
Salt samples were collected from a total of 242 households on the day of survey and tested for iodine content using iodometric titration method in the laboratory (Table 1). The proportion of household salt samples having less than the recommended levels of iodine (<15ppm) was 97% in the Dongria Kondh in comparison to 74.3% in the Dombs. The percent of household samples had adequate iodine (>15ppm) was lower for the Dongria Kondh than for the Domb. School age children (6-12 years) examined for their goitre status by palpation method and graded according to WHO classification (Table 2). Prevalence of total goiter rate ranged from 23.1% for Dongria Kondh and 25.2% for Domb children indicating the problem of iodine deficiency disorders (IDD). Urinary iodine excretion levels were estimated from 345 samples by wet-digestion method. The proportion of children having mild, moderate grades of IDD were lower among the Dongria Kondh children than their counterpart Domb children, while severe grade was higher than the latter, which reflect poor iodine nurture of study populations.

Fig 1. Nutritional status of preschool children (0-5years) by SD classification



On Going Studies

Height-for-age



Weight-for-height

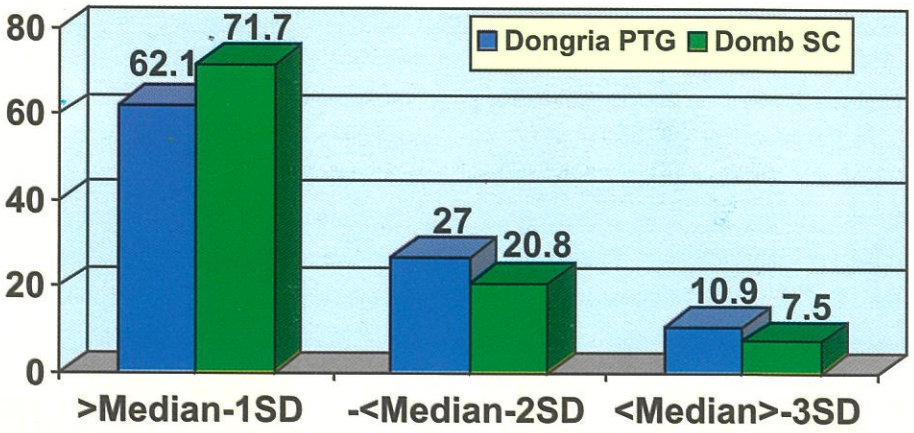


Table 1. Iodine content of households salt samples by titration

Salt iodinecontent (ppm)	Dongria Kondh(168)	Domb SC(74)
0.0-7.0	51.2	18.9
7.1-15.0	45.8	55.4
15.1-30.0	2.4	14.9
>30.1	0.6	10.8

Table 2. Prevalence of goiter and urinary iodine excretion levels among school-age children.

Goitre grade	Dongria (n=234)	Domb SC (n=111)	Urinary iodine Excretion (ug/L)	Dongria PTG (n=234)	Domb SC (n=111)
Grade 0	76.9	74.8	Normal (≥100.0)	38.9	36.9
Grade I	12.0	13.5	Mild (50-99.9)	21.4	37.0
Grade II	11.1	11.7	Moderate (20-49.9)	25.8	26.1
Total goiter	23.1	25.2	Severe (<20)	13.9	9.0

Fig 2. Nutritional status of aduls by BMI (kg/m2)

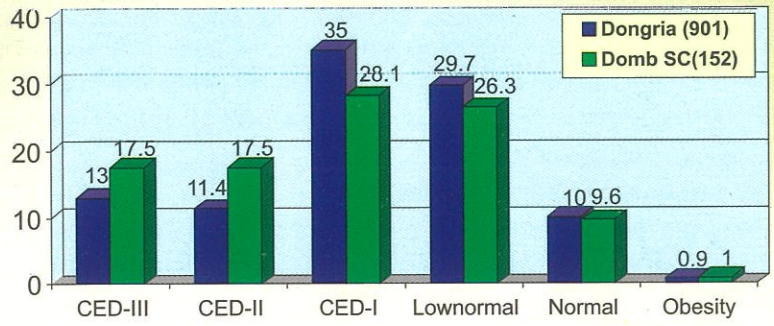
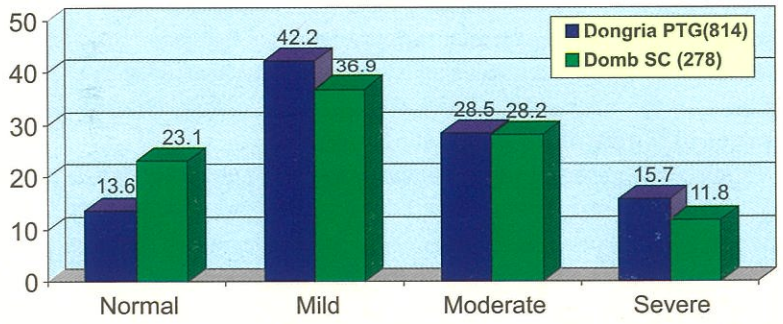


Fig 3. Prevalence of anaemia by haemoglobin levels (g/dl)



1.11 Epidemiology of Viral hepatitis in primitive tribal population of Orissa

Status :
Extramural multicentric
(ICMR tribal Task force)

Investigator :
Dr. S.K. Kar,
Dr. B. Dwibedi,
Dr. B.V. Babu,
Dr. A. Mohapatra,
Dr. A.S. Acharya,

Starting date : March 2005
Closing date : September 2008

Objectives:

1. To estimate the prevalence of hepatitis virus infection (A, B, C, D & E) in primitive tribal population of Orissa and distribution of genotype markers among HBV and HCV infected cases.
2. Identification of risk factors of hepatitis virus infection.

Progress:

The study envisages clinical examination and history recording, risk factor assessment and serological screening of hepatitis virus infection of sample study population, followed by genotyping of HBV and HCV positive cases with estimation of viral load.

Mayurbhanj district has been selected as the study area. The primitive tribes identified in this district are Lodha/Saora Lodha, Kharia / Hill kharia, Mankidi and Mankidia. These primitive tribes are distributed in seven community development blocks of the district and their population is as follows; Kharia/Hill Kharia-1733, Mankidi and Mankidia-723 and Lodha/Saora Lodha-3400.

The total of 2500 individuals from these primitive tribes are enrolled into the study as ascertained by PPS sampling technique. Fieldworks have been initiated. Funds for the extramural study waited from Council.

On Going Studies

Status : Extramural (University of Toronto)
Investigator : Dr. A.S. Kerketta
Starting date : August 2004
Closing date : July 2007

1.12 A 6-year's Prospective study of the risks of death by cause from tobacco and alcohol use among 2 million Indian men and women: a multicentric study.

The study is being implemented with the collaboration of the office of Registrar General of India (RGI) and Centre for Global Health and Research (CGHR) over the last three years to improve the overall cause of death reporting and to add analytic epidemiological questions to Sample Registration System (SRS), which is India's flagship mortality measurement system.

The study envisages the following activities:

1. Training and retraining of the SRS supervisors on verbal autopsy methodology:

So far the training of 700 RGI supervisors (including other centers), who conduct the semi-annual survey on deaths and births in SRS units has been completed. Training duration is 5 days and uses a "sandwich" approach combining practical fieldwork with training in Epidemiology, 10th International Classification of diseases and injuries. The training is repeated every six months so as to ensure skill levels remain high.

Orissa SRS covers 36.7 million people; spread over 405 units and having 51 supervisors to carry out survey on vital statistics for every half year. The training of the supervisors of DCO Orissa was conducted on verbal autopsy methodology after which for first time the VA was implemented in SRS, during 2nd HYS of 2002 and 1st HYS of 2003.

2. Resampling of 10% of VA of SRS supervisors

A total of 2780 deaths were recorded from all age groups during these surveys. All the VA forms reviewed by the PI for completeness and accuracy and have been transferred to the Regional data entry centre i.e. Epidemiological Research Centre, Chennai. Refresher training was imparted to the SRS supervisors especially on the use of newer modified manual, use of single page VA form and symptoms list. In the Special Survey of death (SSD) covering period of 2001-2003 (except the HYS mentioned earlier) VA have been undertaken on a total of 7000 deaths.

These forms have been sent for scanning at office of RGI, Delhi. Resampling of 10% death event was conducted for both the 2nd HYS and 2003 1st HYS as a quality control measure.

3. Assigning of cause of death as per ICD-10.

The physicians from SCB Medical college, Cuttack were trained in on assigning cause of death (coding) in October 2004 and refresher training was conducted by RMRC in June 2005.The probable underlying cause of death assignment and coding as per ICD -10 has been initiated on web-based. So far 290 forms has been coded. The VA has ben initiated by SRS supervisors in the new SRS frame of 2004.

1.13 Molecular spectrum and morbidity pattern of thalassemia and haemoglobinopathies in Orissa

Objectives:

1. To study the pattern of haplotypes and mutations of b-thalassemias and other structural hemoglobinopathies like Hb S, Hb E prevalent in the state of Orissa.
2. To find out the correlation, if any, of these mutations with the clinical manifestations such as degree of splenomegaly, level of fetal hemoglobin and severity of anemia.

Progress:

The project was approved by the SAC of the Centre in September 2003 and ethical committee also cleared the project. The project has been submitted to the Council for funding on 15th October 2004. Funds are not yet received. Preliminary work is to be initiated with intramural funds.

1.14 Study of health consequences of domestic violence with special reference to reproductive health

Status:
Extramural
Investigators :
Dr. R. S. Balgir
Collaborators:
Dr. Sarita Agarwal (SGP Institute of medical Sciences, Lucknow, Dr. R.K. Jena (SCB Medical College, Cuttack), Dr. D.K. Patel (VSS Medical College, Burla), Dr. L.K. Meher (MKCG Medical College, Berhampur)
Consultant :
Prof. B.C. Kar, Ex-Prof. of Medicine, VSS Medical College, Burla
Coordinator :
Director, RMRC, Bhubaneswar

Status :
Extramural (ICMR Taskforce)
Investigators :
Dr. S. K. Kar,
Dr. B. V. Babu,
Dr. A. Mohapatra
Starting date : March 2004
Closing date : October 2005

The role of socio-economic and cultural factors influencing women's status including health is well documented by various studies. Since gender imbalances influence women's health and well being to a large extent throughout their life cycle, it is important to understand the reproductive health consequences with a gender perspective in different settings. Irrespective of racial, social, religious, ethnic, and economic backgrounds, the problems of gender related health consequences are present in Indian society and could be more damaging at individual level where culture of silence helps it to persist. Fear and insecurity have taken over the self-esteem and confidence of women despite their capacity and willingness to meet the challenge.

One of the major epitomes of unequal power relationships between women and men is domestic violence. According to WHO, violence is the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, mal-development or deprivation. Domestic Violence in the family or at home is increasingly recognized as a major health problem with serious health and economic consequences.

Domestic violence takes place when an adult misuses his/her power to control another and it is the establishment of control and fear in a relationship through violence and other forms of abuse. The violence may involve physical/emotional abuse, sexual assault, threats, psychological torture and social isolation. Studies reveal that violence has an association with miscarriage, stillbirth, preterm labour and birth, foetal injury and death as well as birth of low birth-weight baby. Many women are coerced, pressurised, or battered to submit to unwanted abortions by men who are opposed to child birth. These abused women are less likely to seek pre-natal care and more likely to give birth to low-weight babies. Few studies mostly in high-income countries have shown that physical violence during pregnancy increases the risk of preterm labour or delivery, foetal distress or death and low birth-weight offspring. In rural India, almost one third of all babies are born with low birth weight. Maternal mortality in India is the second highest in the world, estimated to be between 385-487 per 100,000 live births and around 125,000 women die from pregnancy and pregnancy related causes each year. Antenatal services are poor with only 53.8 per cent receiving tetanus toxoid injections and 46.8 per cent having their blood pressure measured and 80 per cent of women are anaemic. As many as 58 per cent reduce their food intake during pregnancy instead of increasing it. Two-thirds of deliveries still take place at home, with only 43 per cent supervised by health professionals. Violence is another phenomenon that is reported during pregnancy, besides its occurrence before the pregnancy.

Women aged between 20 to 34 years of age suffer the highest rates of domestic violence compared to other age groups and pregnant women are more likely to develop pregnancy/obstetric related problems due to domestic violence. WHO (2000) noted that among women aged 15-44 years, gender violence accounts for more deaths and disability than cancer, malaria, traffic injuries and war put together. Women who are victims of domestic violence are 12 times more likely to attempt suicide than those who do not experience such violence. It is estimated by World Bank that rape and domestic violence account for five percent of the healthy years of life lost to women of reproductive age in developing countries. The largest discrepancies are due to deaths from violence. Homicide is a leading cause of death among pregnant women.

The present study is an attempt to gather first hand information and analyse various pathways, outcomes and their relationships with domestic violence and related issues. It is initiated to study the relationship between the acts of violence, its reasons and health consequences.

On Going Studies

Objectives:

1. To understand the people's perception of domestic violence.
2. To know the prevalence of domestic violence.
3. To find out the factors associated with domestic violence.
4. To identify gynaecological and obstetric outcomes of domestic violence.
5. To study it's perceived health consequences with special reference to reproductive health.
6. To report how women cope with domestic violence.

Materials and methods:

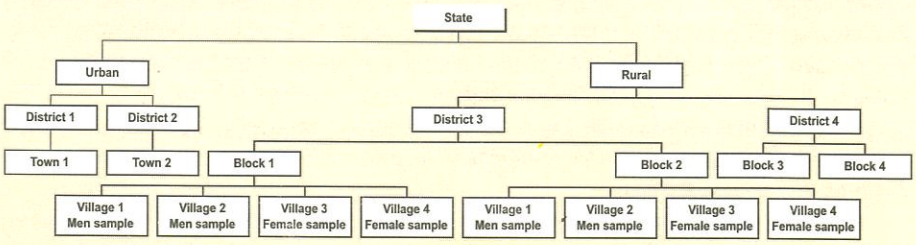
As it is a multi-centric study, it is initiated in all the six zones of India i.e. Northern, Southern, Eastern, Western, Central and North-East zones. Three states from each zone are selected to have a wider representation of the zone. Since the prevalence rate of domestic violence is different for each state, the sample also differs which is calculated using the following method.

According to NFHS-2, the bad obstetrics outcome of pregnancy is 8% and it is expected that the risk will be double with women subjected to abuse or violence. To detect this difference, a sample of about 282~300 married women meeting violence are considered for the study (Alpha=0.05 and 1-Beta=0.80) in each zone. Therefore, 325 women meeting violence (which include a margin of 10% non-response) were enrolled. The women with no history of violence were also included. They acted as control group. Therefore, a total of 375 cases and 375 controls would be studied to achieve the required sample. The same number of male sample is also included in the study. To attain the above sample of women and men, adequate numbers of eligible couples are interviewed in each state depending on the prevalence of domestic violence as reported by NFHS-2. The state with high, medium and low prevalence rate of domestic violence are considered.

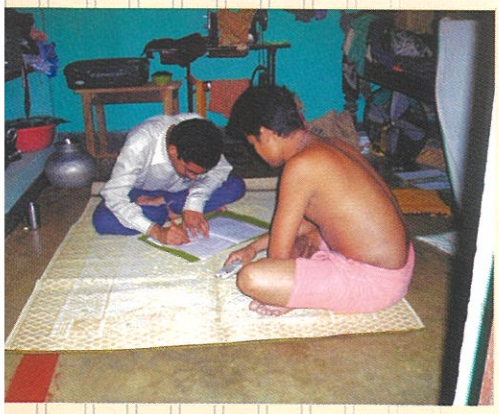
The RMRC, Bhubaneswar was given the responsibility of conducting the study in Eastern zone. The zone consists of Orissa, West Bengal, Bihar and Jharkhand states. However, the study has been conducted in the states of Orissa, West Bengal and Jharkhand. The prevalence of domestic violence is largest in Orissa (28.9%) followed by Jharkhand (26.6%), and it is lowest in West Bengal (17.6%). The Jharkhand being a newly created state is a part of Bihar and reported 26.6% violence rate, the sample for this state has been calculated considering this rate. Thus, the sample considered for the three states are: 432~450 for Orissa, 469~500 for Jharkhand and 710~750 for west Bengal. The total sample required from Eastern Zone would be 1700.

Both urban and rural areas were considered for sampling. From each state four districts were selected from different corners of the state. Keeping in view the 70:30 ratio of rural: urban population, the sample sizes were calculated. Pictorial representation (Fig.1) depicts the procedure of selecting the sample from both urban and rural areas.

Fig. 1. Pictorial presentation of the sampling



The study involved collecting both quantitative and qualitative data. The research team met village/community heads, elders, etc. before initiating the data collection. Rapport is



Indepth intervention on domestic violence

established with the family members and specially the woman is taken into confidence to get data on violence particularly. All married women of each household in the age group between 15-49 were sampled. Corresponding to the women sample men of the neighbouring village were selected. The quantitative data from men and women were collected by using a structured questionnaire. The qualitative data were collected through focus group discussions and case studies. The case studies were aimed to explore the coping strategies of women who experienced domestic violence. Standard methodology is followed during collection of qualitative data. The details of samples collected are shown in Table 1 and 2.

Table 1. Districts covered under the study in Eastern zone of India

Name of the state	Rural-1	Rural-2	Urban-1	Urban-2
Orissa	Puri	Sambalpur	Dhenkanal	Nayagarh
Jharkhand	Saraikela-Kharsawan	Hazaribag	Jamshedpur	Bokaro
West Bengal	Medinipur	Jalpaiguri	Durgapur	Malda

Table 2. The details of the sample

Name of the State	Habitat	Quantitative data collected		FGDs conducted	Case studies collected
		Male	Female		
Orissa	Rural	320	320	4	2
	Urban	142	140	4	4
Jharkhand	Rural	352	352	4	4
	Urban	150	150	4	2
West Bengal	Rural	528	528	4	5
	Urban	224	224	4	1
Total Sample		1716	1714	24	18

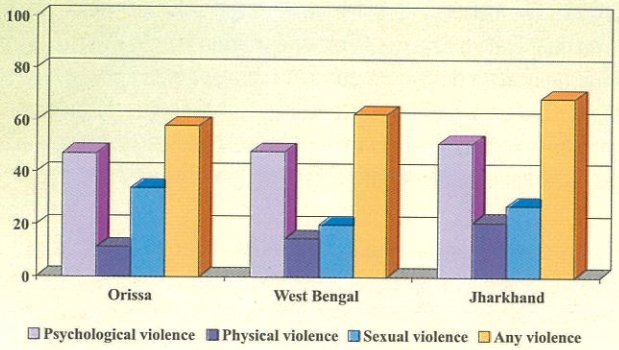
The quantitative data are being computerized through Epi-Info. All the FGDs were recorded on audiocassettes. The cassettes were played back and transcribed into the local language, and thereafter translated to English. Shortly, these scripts will be computerized as text files. The analysis will be done by using Atlas/ti for Windows.

Results:

The data entry and analysis are being initiated. However, the data on few issues have been picked from the questionnaires and analyzed for preliminary reporting. The investigation created three principle measures for domestic violence against women: any psychological violence, any physical violence and any sexual violence. These behaviour-based outcomes measured both lifetime prevalence (occurred at least once in womens' married life) and during pregnancy. Overall, about 58% of women in Orissa, 62% of women in West Bengal and 68% of women in Jharkhand reported experiencing at least one form of violence. Up to 51% women reported psychological violence, 21% women reported physical violence and 34% reported sexual violence (Fig. 2). The prevalence of all forms of violence is highest in Jharkhand state, followed by West Bengal and Orissa. However, the sexual violence is more prevalent in Orissa than in the remaining states of the Eastern zone.

Fig. 2. Overall prevalence of domestic violence

Per cent



We attempted to assess the impact of occurrence of domestic violence on reproductive outcome. Of the ever-pregnant women surveyed, 29.8% of women reported at least one form of violence during pregnancy. The rates of pregnancy outcome among these women are compared with those women who have not reported any form of violence during pregnancy (Table 3). A few women who are presently pregnant are excluded from the analysis. It is clear that violence has a serious impact on pregnancy outcome. The percentage of full term live births is significantly lower among women who experienced violence during pregnancy than their counterparts. Violence has been linked significantly with increased risk of pre-term births, still births and spontaneous abortions/miscarriages. Thus, violence operated through multiple pathways to affects women's sexual and reproductive health.

Table 3. Various indicators of reproductive outcome among women who reported violence during pregnancy and women with no experience of violence

Reproductive outcome	Women reported no violence (n=955)	Women reported violence (n=416)	Significance
Full term live births	832 (87.1%)	301 (72.4%)	0.000
Pre term live births	87 (9.1%)	55 (13.2%)	0.021
Still births	11 (1.2%)	19 (4.6%)	0.000
Spontaneous abortions and miscarriages	22 (2.3%)	38 (9.1%)	0.000
Induced abortions	3 (0.3%)	3 (0.7%)	0.545

Status : Extramural (DBT)
Investigators : Dr. B.B. Pal, Dr. G.P. Chhotray
Collaborator : Dr. D.V. Vijai Singh, Institute of Life Sciences, Bhubaneswar
Starting date : July 2005
Closing date : June 2008

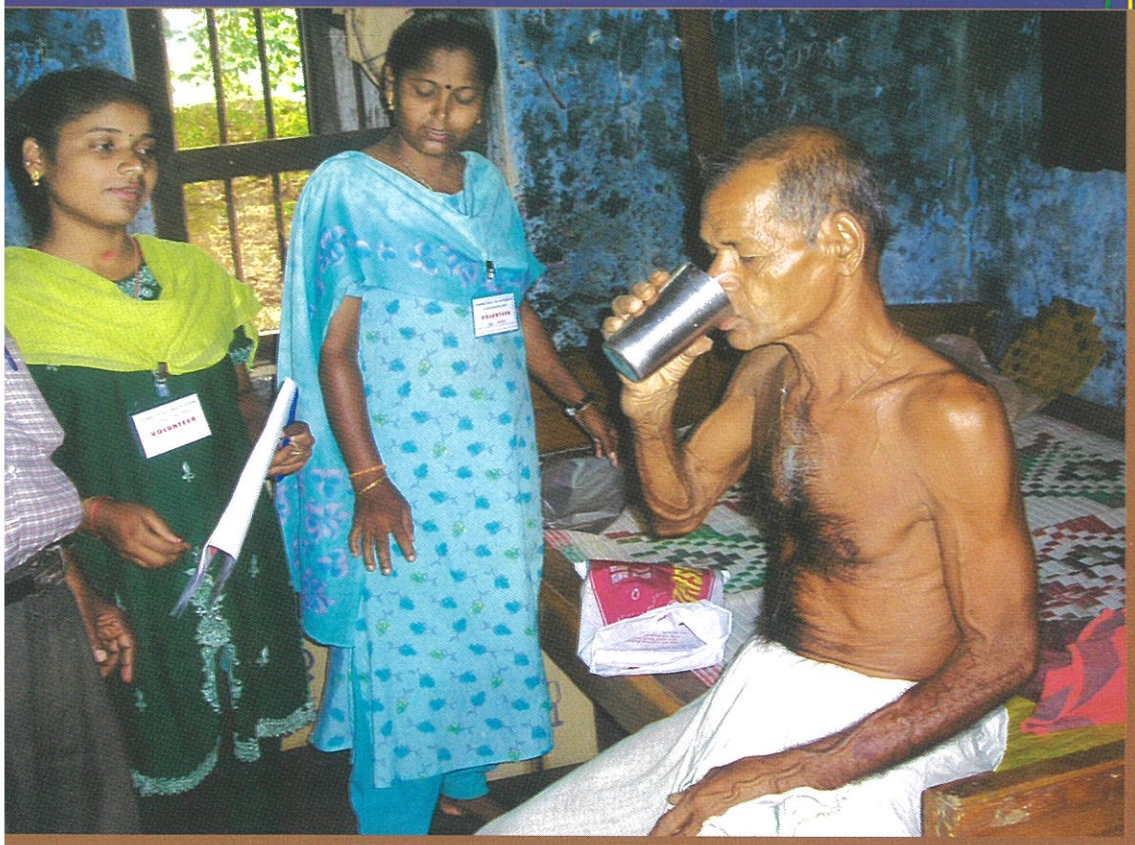
1.15 Molecular monitoring of *Vibrio cholerae* in hospitalized diarrhoeal patients and aquatic environment in Puri district of Orissa"

The above research project has been submitted to Department of Biotechnology July 2005. Funds awaited.

Progress of work:

A total of eight strains of *Vibrio cholerae* were provided by RMRC to ILS . These strains were further tested by septaplex PCR for specific sero-group, presence of virulence and regulatory genes and SXT constin. Further work is in progress and more number of strains will be tested by Septaplex, Hexaplex PCR and will be characterized by ribotyping, ctx typing etc. after receiving fund.

2. OTHER STUDIES



2

INSIDE

2.1 Post DEC Side reactions after Mass Drug Administration of DEC in Choudwar, Orissa

2.2 Brief Report of Investigation into the cause of outbreak of jaundice in Badakodanda village, Bhanjanagar, Ganjam, Orissa

2.3 Effect of Annual single dose of DEC in filariasis transmission

2.4 Referral services render for hemoglobinopathies:

2.5 Monitoring malaria control activities in Orissa

2.6 OPD SERVICE TO THE PATIENTS WITH FILARIASIS AT CAPITAL HOSPITAL, BHUBANESWAR

Other Studies

Investigators:

Dr. B. Dwibedi, Dr. A. SAcharya,
Mr. P.K Jangid, Mr. R.C. Parida,
Dr. S.K. Kar , Mr. S.C. Rout,
Mr. T. Moharana, Mr. K. Dhal and
Mr. R.N. Nayak

2.1 Post DEC Side reactions after Mass Drug Administration of DEC in Choudwar, Orissa

Global strategy towards elimination of filariasis has been formulated to eliminate lymphatic filariasis from endemic countries using DEC tablets annually. Annual mass drug administration of DEC has been initiated in endemic states of India. Orissa is the one among them. Eighty percent coverage and compliance to DEC therapy is expected to eliminate lymphatic filariasis from endemic communities. But, fear of side reactions and occurrence of adverse events following DEC intake is inhibiting the common men to take the drug even if distributed at the door step free of cost. So, it has been felt very important to look for the extent of occurrence of side reactions and search for health related factors which might be associated with development of adverse reactions.

Objectives:

To observe the adverse reactions reported by the individuals and associated health events of the affected population, following treatment with DEC during MDA programme in Choudwar town of Orissa.

Materials and method:

The old urban settlement of Choudwar Town of the state of Orissa was taken as the study area. After defining the area and population under study a door-to-door survey was conducted. The investigating team consisted of physician, statistician, lab technician, lab assistant and census taker. Every house was covered, starting from one mark or point of a street or lane, ward after ward. Individuals of each household were questioned about their drug intake and side effects experienced. Detail history of adverse reactions was noted from those who reported it. Age, sex, social & economic status, pattern, onset and severity of adverse reactions, treatment taken for side effects, presence of any known disease (e.g., filariasis, acid peptic disorder, blood pressure disorder, worm infestation, diabetes, etc.) of the subject were noted in a preformed format for assessment and investigation. Individuals who reported side reactions were tested for filarial antigenaemia by rapid ICT Test. (Bimax ICTkit) .

Observation:

A total population of 13,610 were covered during the survey. Among them 10,517 (77.3%) individuals received the recommended DEC tablets during MDA programme and 7956 (75.6%) of those who received the drug consumed or swallowed the supplied drug. Four hundred sixty (5.8%) of those who consumed the drug reported some side reaction following therapy. Those individuals were questioned and examined by the team and the observations are mentioned in subsequent paragraphs.

Individuals between fifteen to forty five years of age constituted sixty percent of the whole population affected and forty six percent were in the age range of 22-45 years. Females were the major sufferers. 61% individuals were from low socio economic status families and 38.3% belonged to middle socio-economic status group.

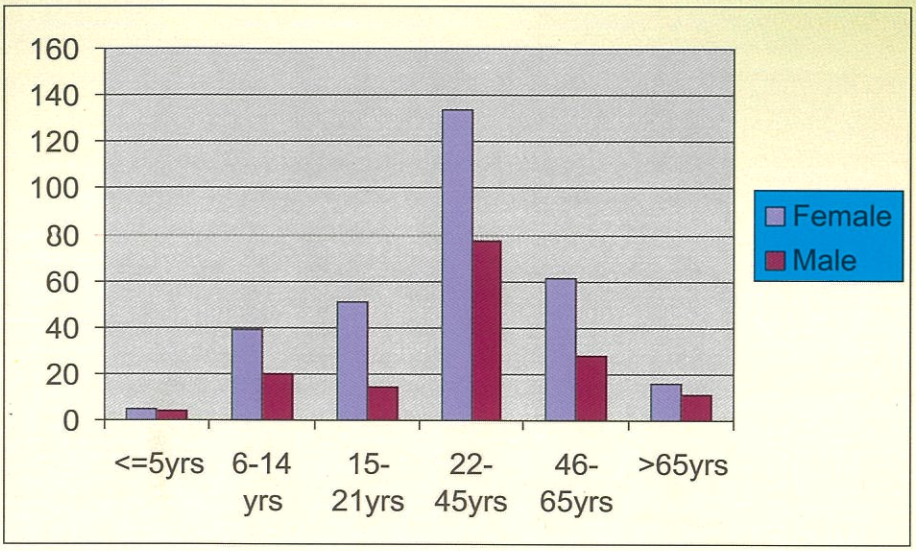


Fig.1 Age and Sex distribution of individuals who reported side effects

Presence of filarial antigen in the blood of the individuals who reacted to DEC therapy was tested by *W. bancrofti* specific rapid diagnostic kit (ICT kit, Binax, Portland, USA). This test was not done in fifty-eight (12.6%) persons. Antigenaemia was detected in 50.4% subjects, where the test has shown negative result in 37% tests done.

We observed systemic reactions as the predominant type of adverse reaction and more than 90% of affected persons had one or more systemic complain. Head reeling was most frequently reported and observed in 341(74%=460) individuals. Drowsiness (21.1%), fever (10.4%) and body-ache (9.6%) were the other systemic reactions noted in order.

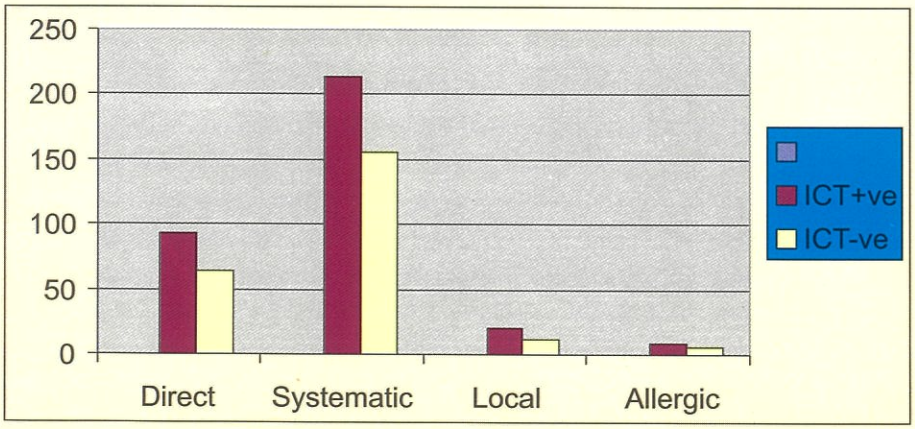


Fig. 2 Different types of side effects in relation to CFA status

Other Studies

Adverse reactions having predominant initiation within first three hours were reeling of head (65.4%), nausea (59.85%), vomiting (52.2%), fatigue (53.6%) and abdominal pain (40.9%). But urticarial rash, ADL, Limb edema and scrotal inflammatory response had late onset beyond 6-24 hours in majority of cases.

Side reactions due to DEC intake are usually attributed to inflammatory response induced by dead microfilaria or adult parasite. But our study reported absence of filarial antigenaemia in a quite large number of persons (170/402) reported to have adverse effects and observed some pathophysiological factors related to human host which might have association with the adverse reactions.

Clinical presence of pallor was observed in 36.1% of individuals. Signs of nutritional deficiency (under nutrition) was noted in 10.7% of side reaction affected population. Symptom of acid peptic disorder was reported by 5% of the population during interrogation and disorders of blood pressure was complained by 2.8% of individuals. Sixty-one persons had suffered from one or multiple episode of filarial lymphangitis/ adenitis or chronic filarial disease expression before consumption of DEC during MDA program. History of epileptic disease was present in three persons. History of worm passage was given by 17 (3.4%) individuals. All these observations were based on clinical observation and personal history.

Majority of individuals (447/460) i.e. 97.2% swallowed the DEC tablets after food and the rest (2.8% only) in empty stomach. Seventy nine percent (364/460) persons had taken the tablets in the afternoon hours, where as 16% consumed at night and 5% in morning time.

Conclusion:

Side reaction to DEC mass treatment is occurring, though not too high in prevalence. It is affecting mass psychology in consuming the drug in subsequent dose schedules. For successful continuation of the elimination programme, important measures to be taken should be: (1) Minimising occurrence and severity of the side reaction if possible by modifying the drug or host factor; (2) Making the common men understand that the adverse event which might be experienced will be well tolerated and be well controlled and the benefit that the community gets is much greater than the discomfort it gives. The present study reported that 37.1% of the persons who reported side reactions do not have filarial infection (ICT-ves) in them and systematic abnormalities like anaemia, malnutrition, acid peptic disease, etc. are present in different proportion in the affected population.

So well documentation of the side reactions in controlled studies emphasizing on the existing systemic pathophysiology of the host (i.e. human being) to find out correlation or association with the occurrence of different adverse reactions is essential, so as to take preventive measures to minimise them.

2.2 Brief Report of Investigation into the cause of outbreak of jaundice in Badakodanda village, Bhanjanagar, Ganjam, Orissa

Investigators :
Dr. B. Dwibedi, Dr. S.K. Kar, Mr. R.C. Parida, Mr. S.C. Rout, Mr. T. Moharana, Mr. K. Dhal, Mr. R. N. Nayak, Mr. K.C. Nayak

Collaboration:
Dept. of Biochemistry, SCB Medical College, Cuttack

Background:

Hundreds of people of Badakodanda village,of Ganjam district, developed jaundice in a short period which was the report of local newspapers during second week of June 2005. Disease Surveillance Cell of Directorate of Health Services, government of Orissa initiated the preventive and treatment measures. Subsequently, on request from the said department, the outbreak was investigated by the team from Regional Medical Research Centre (RMRC) during 5.7.2005 to 7.7.2005. The work adopted and observations there of is given in the following lines.

Field visit and laboratory procedures:

The team of investigation consisted of a physician, lab. technician, one lab assistant, two census takers and one field attendant. The team conducted the field work from 5.7.05 to 7.7.05 in the affected Badakodanda village under Community Health Centre (C.H.C.) Bhanjanagar, Ganjam, Orissa with help of concerned health personnel and field level health workers.

A house to house survey was done and persons with complaints of jaundice, fever, anorexia, vomiting, etc. were examined. Members of the affected household without any symptoms were also examined in detail. The clinical history and examination were recorded in preformed questionnaire formats. Affected individuals were given therapeutic advice and immediate primary treatment, whereas households were instructed how to take precautionary measures to prevent spread of the infection. Drinking and food habits and toilet habits of the affected population were looked into, to seek for the source of contamination and spread of the agent.

Blood samples (2 ml of venous blood) were collected from individuals writter with consent for serological and biochemical tests. The collected blood samples were centrifuged and serum was separated in the field. Coded serum samples were stored and transported in icebox to RMRC laboratory.

Presence of IgM antibody to hepatitis A and E virus was tested in the Institute laboratory by ELISA method using Bio ELISA hepatitis detection kits. Biochemical test on a subset of the samples was conducted to quantitatively measure the liver function at the Dept. of Biochemistry, SCB Medical College, Cuttack.

Result of observation:

Report of the field level health worker regarding onset of jaundice and individuals affected was looked into and attempt was taken to examine in detail maximum number of

Other Studies

the affected households possible during the period of investigations. We examined a part of the total affected households in detail. During the field visit members of 140 households, covering the whole village, were surveyed in detail. Out of these, 108 numbers of families were affected involving 122 numbers of individuals.

The examined population were Hindus by religion and from middle to low socio-economic status. Out of the total 122 patients examined 6 (4.9%) were below 15 years of age and 71 (58%) were males.

AGE (years)	MALE	FEMALE	TOTAL
5-14	4	2	6(4.91%)
15-45	49	31	80 (65.57%)
46-65	13	14	27 (22.13%)
>65	5	4	9 (7.37%)
Total:	**71(58.19%)**	**51(41.80%)**	**122**

Major symptoms complained by the individuals were fever, joint pain, body ache as prodormal symptoms before appearance of jaundice whereas, anorexia, nausea, vomiting, epigastric pain were noted during the icteric period. More than one third complained of pruritus and urticarial rash during the second half of icteric phase. The average period of persistence of visible jaundice was two weeks and average period of persistence of symptoms was three weeks. None of them were severe enough to be hospitalised. And more than two third were recovering from illness during examination.
Cause of Jaundice and pathogen.

The acute onset of symptoms, mild to moderate presentation, clustering of cases during a short period and the range of symptoms and presence of icterus, hepatic tenderness and urticarial rash provisionally pointed the episode towards an epidemic of acute viral hepatitis caused by an enterically transmitted hepatitis virus.

Serological tests results:

IgM antibody to hepatitis E virus was detected in 76 (62%) serum samples tested (n=122).

Biochemical test results:

Biochemical test for hepatic function was conducted in a subset of 45 samples. Serum billirubin (total) of the elevated in 73.8 % of cases.

Search for Source of Transmission and cause of Spread:

The source of water supply to the entire village was found to be from a river stream, which is supplied through water pipes after filtration through a filtration well. No

common food source like hotel, carterer, or festive occasion was found to be the suspected source causing jaundice. So the common water supply was presumed to be the source, which might have been fecally contaminated. More than fifty percentage of the studied population use open field for defecation and they do not adopt proper hand washing with soap and water after toilet. So combined effect of contamination of water supply causing generalised transmission and improper hand wash after toilet contributing to household secondary cases, is the most probable cause of spread of the viral agent. Isolation of the agent from water, food and/or faeces would have given the confirmatory results, which could not be done at present available facilities.

Interpretation:

The reported outbreak of jaundice from Badakodanda village under Bhanjanagar C.H.C was confirmed to be an epidemic of Acute Viral Hepatitis caused by hepatitis E virus.

The large scale spread in a short time period can be originated from a sporadic case and the faecal shedding of the virus contaminated the common water supply to the village, which led to the primary infection enmass. Possibilities of household transmission via food and water due to improper hand wash and continued faecal contamination of the water supply can lead to secondary infection and subsequent continuation of the epidemic if not prevented.

Recommendation:

Following measures can be undertaken to arrest transmission of the virus and prolongation of the epidemic along with clinical stabilization of the individual patients.

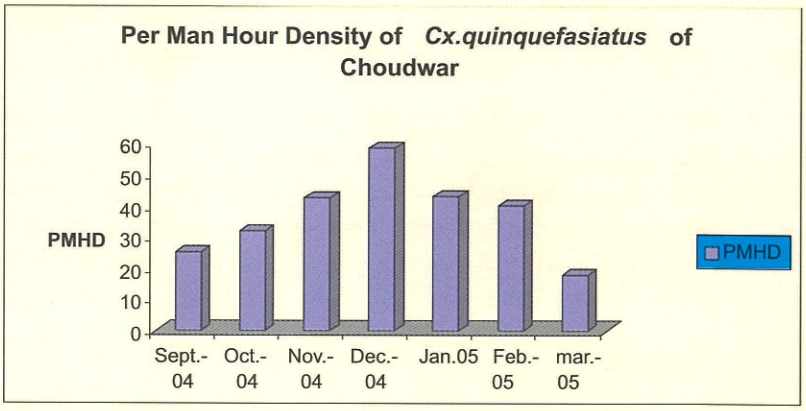
1. Chlorination of the drinking water supply.
2. Finding out and sealing any leakage during filtration and water supply through piping.
3. Reinforcing boiling of drinking water at household level
4. Advice for proper hand washing with soap water after toilet use.
5. The village people should be educated to use the field away from (at least 150ft) the river stream supplying water to their village, for toilet purpose, if latrine facility is not available.
6. Advice to take freshly cooked food as much as practicable
7. Individual patients should consume their normal diet as were taking earlier and not to reduce the amount or restrict any food items which are not eaten in excess.
8. Affected pregnant mothers should be given extra medical care and be advised to seek specialised treatment, as most often they end in complications.

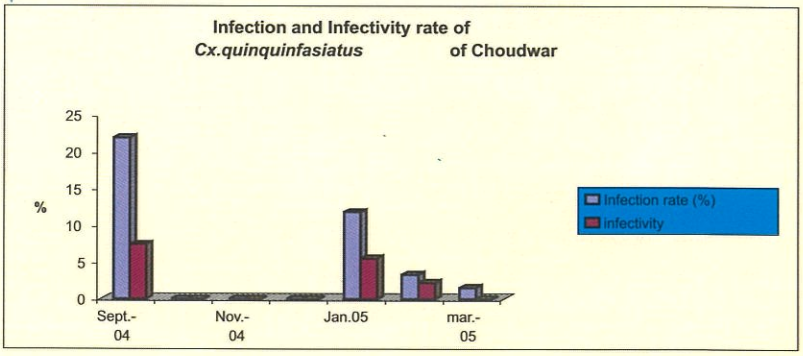
2.3 Effect of Annual single dose of DEC in filariasis transmission

DEC is highly effective microfilaricidal drug. Use of these drugs at community level results in reduction of human infection and consequently transmissions. In some areas due to high vector density effective reduction in transmission does not occur. Choudwar town of Cuttack district though a semi urban area is highly endemic for filariasis.

Other Studies

Single dosage of DEC mass drug distribution was done on15.9.04.Baseline data on vector density, infection rate, infectivity rate and infective stage of parasite per mosquito (l3 load) were collected before and after the mass drug distribution. The month wise vector density (PMHD) of *Culex quinquefasciatus* is presented in fig 5. It varies from 18.3 to 58.6 in different months of the year. Figure 6 depicts the infection and infectivity rate of *Cx. quinquefasciatus*. It clearly Indicates that soon after the drug distribution no infective larvae could be detected up to three months (October to December). However, from the month of January,2005 infection in the vector appeared. There was 45.7% and 26% reduction in infection and infectivity rate compared to the base line data. Still the infection could be





State health authority requested to evaluate the National vector borne disease control programme's activity in two districts of Orissa i.e. Boudh and Jagatsingpur. The work was carried out and the report of the activity was submitted.

Investigators:
Dr. R. S. Balgir,
Dr. G.P. Chhotray,
Dr. M.R. Ranjit,
Mr. B.N. Sethi,
Mr. K.C. Dalei,
Mr. B.K. Kanhar

2.4 Referral services render for hemoglobinopathies:

Referral Services were rendered for diagnosis to the cases referred from local PHCs, hospitals and Medical colleges and Hospitals in Orissa. In one series diagnostic services were provided to 68 families referred during period from April 2004 to March 2005, for electrophoresis, a total of 176 subjects were screened. Out of 176 cases, 20 (11.4%) were diagnosed as homozygous sickle cell disease, 56 (31.8%) sickle cell trait; 3

(1.7%) β-thalassemia Major, 6 (3.4%) β-thalassemia trait; 1 (0.6%) Hb AE, and 90 (51.1%) cases were found normal. Of the 176 cases, 135 (76.7%), 38 (21.6%) and 3 (1.7%), respectively belonged to general castes, scheduled castes and scheduled tribes. Genetic/ marriage counselings were given to affected families.

In another Series, a total no of 137 (83 male and 44 female) cases were referred from various medical colleges and peripheral hospitals of the state for investigation and confirmation of diagnosis for various haematological disorders. Most of the cases were having complains of refractory anaemia , progressive weakness and jaundice. Out of 137 cases, 119 belong to General category, 11 to Scheduled tribe, 4 to Scheduled caste and 3 to Muslim community. A detailed clinical examination and laboratory investigation such as haematological profile by automated cell counter (MS9), quantitative analysis of Hb, Hb A2, HbF and its electrophoresis was carried out by established methods. Out of total 137 cases -% were found to be electrophoretically normal (Hb AA), -% were HbAS , -% HbSS, -% S beta thalassaemia, -% beta thalassaemia minor,-% beta thalassaemia major and -% E beta thalassaemia .The community wise distribution of the Hbpathies has been shown in table 1. Molecular characterization of these samples revealed the presence of IVS1-5 (G->C) mutation in all the cases of beta thalassaemia.

Table1: Caste wise distribution of Hb pathies amongst the referred cases

Category	Total	AA	AS	SS	SB	βthal major	βthal minor	E βthal
General	119	44 (56.9%)	19 (15.9%)	8 (6.72)	2 (1.68%)	15 (12.6%)	27 (22.68%)	4 (3.36%)
SC	4	1 (25%)	3 (75%)					
ST	11	5 (45.5%)	1 (9.1%)	1 (9.1%)		2 (18.2%)	2 (18.2%)	
Muslim	3		2 (66.7%)	1 (33.4%)				
Total	137	50 (36.5%)	25 (18.2%)	10 (7.3%)	2 (1.5%)	17 (12.4%)	29 (21.2%)	4 (2.9%)

2.5 Monitoring malaria control activities in Orissa

Status: EM (NVBDCP)
Investigators:
Dr. B.V. Babu,
Dr. A. Mohapatra,
Dr. R.K. Hazra,
Dr. S.K. Parida
Period : Oct. 2004 to March 2005

The Directorate of National Vector Borne Disease Control Programme requested the centre for intensive monitoring for effective control of malaria. Four endemic districts of Orissa namely, Cuttack, Sonepur, Boudh and Jagatsinghpur, were selected and monitored for a year.

In each district, two PHCs are selected and visited every month for monitoring the malaria control activities. The issues covered during monitoring are epidemiological

Other Studies

trends, early detection and prompt treatment components, integrated vector control, laboratory functioning, spray activities, and manpower, etc.

The scientists made visits to district headquarters offices, PHCs, sub-centres, drug distribution centres (DDCs), fever treatment depots (FTDs), etc. and submitted reports periodically to the Directorate of National Vector Borne Disease Control Programme.

2.6 OPD SERVICE TO THE PATIENTS WITH FILARIASIS AT CAPITAL HOSPITAL, BHUBANESWAR

During the reporting year a total of 528 new cases were clinically examined and diagnosed and treated for different clinical presentations of lymphatic filariasis.Of which the majority 232(44) presented with lymphoedema (LMD) grade I followed by adenolymphangitis (ADL) 179(33.9). Among the acute ADL cases 56(31.3) had only lymphangitis, 38(27.2) had lymphadenitis in the inguinal region, 23(12.8) had both acute lymphangitis and lymphadenitis. Out of which 62(34.6) acute ADL attack was found in chronic lymphoedema cases due to secondary infection known as Adeno Dermato Lymphangio Adenitis(ADLA). All the cases were given treatment and footcare management procedure was demonstrated and advised these patients. A total of 23 lymphoedema cases given decompression therapy.

The Details of the clinical conditions of the OPD cases

Clinical condition	Male	Female	Total (%)
Acute ADL	104()	75()	179( )
LMD* gr I	147(63.4)	85(36.6)	232(44.0)
LMD gr II	21(65.6)	11(34.3)	32(6.1)
LMD gr III	15(75.0)	5(25.0)	20(3.8)
Hydrocele	11		11(2.1)
Orchitis	2		2(0.4)
Nodule	7(77.7)	2(22.3)	9(1.7)
Abscess	1		1(0.2)
TPE	1	1	2(0.1)
Haematuria		1	1(0.2)
Arthritis	6(50.0)	6(50.0)	12(2.3)
Others**	20(74.1)	7(25.9)	27(5.1)

*LMD-Lymphoedema
** Includes Urticaria, Myalgia and peripheral neuritis/neuralgia

Detail clinical presentation of cases with Acute ADL attack

Clinical symptom	Male N%	Feamle N%	Total %
Lymphangitis(LNG)	20(35.7)	36(64.3)	56(31.3)
Lymphadenitis(LND)	33(91.6)	5(8.9)	38(21.2)
ADLA*	36(58.1)	26(41.9)	62(34.6)
LNG+LND	15(62.2)	8(34.8)	23(12.8)

*ADLA – Adenodermatolymphangioadenitis

3. COMPLETED PROJECTS

3

INSIDE

3.1 Immunological characterization of filarial antigens with potential protective response in endemic population.

3.2 A comparison of filarial immune response in people living in different (high and low) endemic regions of Orissa, India.

3.3 Diagnosis of infection and morbidity in lymphatic filariasis: development of field applicable tools

3.4 Role of IgA in Protective Immunity in Human and Experimental Filariasis

3.5 Assessment of therapeutic efficacy of chloroquine in treatment of uncomplicated *P.falciparum* malaria in M.Rampur block of Kalahandi district, Orissa.

3.6 Evaluation of the programme for the insecticide treated bed net and entomological studies for malaria control in three districts (Nawapara, Kandhamal and Kalahandi) of Orissa

3.7 Intervention Programme for Cholera, Intestinal Parasitism, Vit A deficiency and Scabies amongst some primitive tribes of Orissa.

3.8 Intervention programme on nutritional anaemia and haemoglobinopathies in some primitive tribal population of India.

3.9 Intervention for hereditary common haemolytic disorders among the major tribals of Sundargarh district of Orissa

3.10 Mid-term evaluation of improving nutritional and health status of children in Umerkote block of Nabarangapur district, Orissa

3.11 Assessment of iron deficiency anaemia among adolescent girls in Orissa

3.12 Prevalence of Chlamydia trachomatis infection amongst clinical cases attending OPD–a pilot study

3.13 Molecular characterization of *V. cholerae*: Strain typing pattern associated with diarrhoeal outbreaks in Orissa

Completed Projects

Status : Extramural (DBT)

Investigators : Dr. M.K. Das, Dr. M.S. Bal, Dr. M.K. Beuria and Mr. N.N. Mandal

Starting date : July 2001

Closing date : July 2004

3.1 Immunological characterization of filarial antigens with potential protective response in endemic population.

Objectives:

1. Immunological characterization of Dssd1 and lipid antigens with potential for microfilarial clearance from infected animals.
2. To study antibody response to these antigens in endemic normals vs. infected population.

Results:

Earlier we have reported the isolation of an aqueous insoluble, detergent soluble filarial glycoprotein (Dssd1), the antibody response to which is decreased in microfilariae positive individuals but high in microfilariae negative/chronic filarial cases and endemic normals. Surface localization of the Dssd1 antigen in *Wuchereria bancrofti* microfilariae and differential IgG subclass responses in endemic sera were described.

It was also shown that the low or lack of IgG response to Dssd1 is associated with filarial antigenemia (CFA/Og4C3 test) and it is independent of clinical manifestation or parasitological status. Interestingly, depressed IgG levels are noticed in CFA positive vs. CFA negative sera in the same clinical groups, for example endemic normal, hydrocele or elephantiasis patients. The high and low IgG levels to Dssd1 allow a distinction relating to antigenemia in human filariasis. The results in addition show that the antigen assay (Og4C3) primarily detects the carbohydrate determinants of Dssd1. Western blot and periodate oxidation results suggest that antibodies to carbohydrates of Dssd1 are present only in antigen negative sera. Active filarial infection might be linked with the lack of antibody response to the carbohydrate groups. Antigen positive (infected) individuals are devoid of anti-carbohydrate antibodies.

The nature of carbohydrate residues present in Dssd1 antigen was probed through lectin (Concanavaline A, Wheat Germ Agglutinin) coupled to peroxidase. The presence of D-glucose, mannose, N-acetal glucosamine and sialic acid are indicated in the antigen.

Filarial lipid antigens also exhibited higher antibody response similar to Dssd1 antigen, in infection free individuals and diminished antibody response in infected individuals.

Mastomys model for experimental filarae infection was used to evaluate the microfilariae clearance ability of Dssd1 and lipid antigens. Microfilaria appeared in the peripheral blood on day 6 of implantation of gravid adult worm in the peritoneum. Two groups of infected mice with microfilaria in the circulation were immunized with antigens (Dssd1, and lipid antigen). They were immunized twice with each antigen on day 12 and 27 post implantation. It was found that both Dssd1 and lipid immunization drastically reduced the circulating microfilaria from the implanted animals. Antibodies to these two antigens were also detected in the immunized animals.

Further, microfilarial clearance ability of these two antigens were checked in mastomys against challenge infection after pre immunization with the antigens. Significant reduction in microfilariae level was noticed in mastomys immunized with either Dssd1 or lipid antigen compared to control group of mastomys. These experiments indicate anti-microfilariae immunity induced by these antigens.

Conclusion:

Two antigens were isolated from aqueous insoluble residues of filarial parasite *Setaria digitata* – a glycoprotein (designated as Dssdl) and lipid antigens. These antigens although biochemicaly different exhibited similar immunological responses in W. bancrofti exposed people. Diminished antibody level was observed in infected microfilaraemic (antigen positive) compared to uninfected (antigen negative) individuals. In case of Dssdl, the lack or low antibody response in active filarial infection is directed primarily against the carbohydrate determinants of the antigen (Dssdl). Increased antibody response to these antigens in microfilariae negative individuals finds parallel in animal studies. Immunization of the antigen significantly reduced the circulating microfilariae from the implanted Mastomys. The results indicate the ability of these antigens in inducing anti-microfilarial immunity in filarial infection.

3.2 A comparison of filarial immune response in people living in different (high and low) endemic regions of Orissa, India.

Status :
Intramural

Investigators :
Dr. M.K. Das, Dr. M.K. Beuria, Dr. M.S. Bal, Mr. N.N. Mandal

Starting date : January 2002
Closing date : January 2005

Objectives:

1. To estimate the prevalence of anti-filarial antibody isotypes in area of low and high transmission.
2. Age dependent occurrence of some anti-filarial (Dssd and lipid) antibodies

Results:

The study was carried out in people living in an apparently low endemic region (Ramchandrapur village, Jajpur districts, Orissa). A total of 550 people are included in this study. The region is characterized by low rate of microfilariae and chronic cases of filariasis. The number of asymptomatic microfilaraemics, hydrocele and elephantiasis cases were 4, 17 and 5 respectively. The corresponding figures for Mf+ve, hydrocele and elephantiasis in the high endemic region (Khurda) were considerably higher i.e. 62, 75 and 45 respectively (n=500). The vector density, vector infectivity rate, infective larval (L3) load and the transmission index of the area was found significantly low compared to high rate in hyper endemic area (Chhatipur village, Khurda district). Breeding sites of mosquitoes are determined. Almost one cesspit is present adjacent to every households in the region. The practice of use of mosquito nets among the people is around 50%.

Presence of circulating filarial antigen (CFA) level was determined in these sera. A high rate of antigenaemia (50%), in contrast to 25% of antigenaemia in the high endemic zone was observed. About 70% individuals were found positive for IgG antibodies to *Setaria digitata* antigens compared to almost 100% IgG positivity in high endemic Chhatipur village. Dssd1 specific IgG antibodies were present only in 40% of subjects. IgG positivity of 29% to filarial lipid was observed in people living in low endemic area compared to 90% positivity in area of high endemicity. These antibody levels were checked in sera of CFA +ve and CFA-ve individuals. It was observed that CFA-ve sera have higher antibody response compared to sera of CFA positive subjects. Antibody (IgG) levels to excretory Secreotory (ES) antigen, purified from 24 hr culture supernatants of adult female Setaria digitata, were measured in sera of individuals of both low and high endemic area. IgG positivity of 88% and 100% were observed in low and high endemic area respectively.

Age dependent prevalence of filarial antibody to Dssd1 and lipid antigens were determined in both low and high endemic areas. IgG prevalence to those antigens was found to be negligible in young children (1-5yrs). The mean antibody level followed a increasing pattern up to the age group 16-20 yrs and stabilized there after.

Conclusion:

A high rate of antigenaemia was observed in the low endemic region, which is characterized by low incidence of microfilariae and chronic cases of filariasis. It indicates that more individuals were actually infected than those in whom microfilariae was detected. Filarial drug distribution could also be directed against such low endemic regions.

3.3 Diagnosis of infection and morbidity in lymphatic filariasis: development of field applicable tools

Status :
European Commission

Investigators :
Dr B. Ravindran, Dr A.K. Satapathy, Dr P.K. Sahoo, Dr. M. Mohanty

International Collaborators :
Dr. M. Yazdhanbakh, Leiden,
Dr. R.M. Maizels, Edinburgh,
Dr. R. Noordin, Malaysia,
Dr. T. Supali, Indonesia

Starting date : November 2001
Closing date : October 2004

Objectives:

1. Identification of novel recombinant antigens for diagnosis of infection and disease
2. Identification of antibody reactivity patterns and other immunological markers of morbidity that can identify patients at risk of developing clinical disease
3. Verification of the dipstick assays as field applicable tools in endemic population affected by *W. bancrofti* and *B. malayi* infections before and after chemotherapy

Background:

Human lymphatic filariasis is a spectral disease displaying diverse forms of clinical manifestations. It is assumed that repeated episodes of acute disease could eventually lead to development of chronic forms of disease such as lymphoedema/elephantiasis or hydrocele. The progression from infection to development of disease is a very slow process and takes several years. However it is not clear what factors (parasite as well as host) contribute to this sequence of progression of the disease. Antibody responses in human filariasis have so far been largely

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studied by using crude extracts of different developmental stages of filarial parasites. Several filarial antigens have recently been cloned, sequenced and the full-length proteins have been expressed. Thus it is now possible to study antibody responses to specific filarial antigens expressed In one or the other developmental stages of the parasites in different clinical categories of human filariasis and thus search for markers of morbidity- the current study makes an effort in this direction. Since acute disease is perceived to lead to chronic forms of disease there is an urgent need to recognize molecular markers, which could be used for monitoring progression of the disease- quantification of plasma levels of pro- as well as anti-inflammatory molecules is expected to result in identification of such markers. The current project addresses this also.

Major Results and conclusions:

(1) Verification of the dipstick assays as field applicable tools in endemic population affected by *W. bancrofti* and *B. malayi* infections before and after chemotherapy:

About 45 % of sera from Bancroftian filariasis endemic villages react positively with Bm dipstick assay. This was interpreted to be due to either a) possible mixed infections with both W.bancrofti and B.malayi in patients Or b) that the specific Brugia antigen is present only in some strains of W.bancrofti and not in others. DNA from purified Mf from carriers were subjected to PCR using specific primers and all but one Mf sample was found to be pure Wuchereria infection indicating that Bm dipstick positivity in Bancroftian filariasis cases is not due to mixed infection with B.malayi. Further investigations revealed that expression of BmR1 homologs in different field isolates of W.bancrofti but were not uniformly antigenic to be detected by BmR1 dipstick assay.

(2) Identification of immunological markers of morbidity that can identify patients at risk of developing clinical disease

The objectives of this project are to identify molecular markers for assessing i) morbidity, ii) protective immunity as well as iii) immunodiagnostics in human lymphatic filariasis. Since these issues are diverse, three different approaches are being attempted. For identifying morbidity markers to monitor progression of chronic disease, a large panel of pro as well as anti-inflammatory molecules in circulation was monitored. The following molecules were quantified in different clinical categories: 1) IL-6, 2) IL-8, 3) IL-10, 4) TNF-α, 5) TNF-α receptor-55, 6) TNF-α receptor 75, 7) LPS binding protein (LBP), and 8) ICAM-1. The endemic population was categorized into the following groups and for analysis the levels were compared with those of endemic normals: i) Asymptomatic Mf carriers (AS), ii) subjects with cryptic infections (CR), iii) elephantiasis patients, iv) patients with hydrocele, v) acute filariasis cases with filarial antigenemia and vi) acute filariasis cases without antigenemia. Quantitative analysis of circulating levels of the above molecules in the clinical spectrum of lymphatic filariasis offered interesting leads in understanding the clinical manifestations. Acute filariasis were characterized by significantly raised levels of IL-6, IL-8, IL-10, TNF-α and TNFR-55 when compared with endemic normals. The increased level of the above inflammatory molecules in acute disease was not influenced by presence or absence of circulating filarial antigens. The Mf carriers and cryptic cases were also found to display significantly elevated levels of TNF-α although other inflammatory cytokines such as IL-6, IL-8 and TNFR-55 were not elevated in them. The investigations revealed very clear differences between two chronic manifestations of filariasis - patients with elephantiasis were found to have elevated levels of IL-6 and TNFR-75 (Type 2 receptor) while hydrocele cases were displaying enhanced levels of IL-8 and TNFR-55 (Type 1 receptor). Since the two TNF receptors are known to be biologically different the current study has offered a handle to address issues related to pathogenesis of these two diverse forms of chronic disease manifestations. When all the samples were categorized for presence or absence of disease, inflammatory type 1 receptors were significantly elevated in patients with one or the other form of filarial disease and asymptomatic individuals displayed elevated levels of anti-inflammatory type 2 TNF receptor. Interestingly, when the samples were analyzed for presence or absence of only filarial infection (i.e. antigenemia positive cases, regardless of disease status) the type 2 receptors were significantly elevated in antigenemic cases and Type 1 receptors were elevated in non-antigenemic cases. The ratio between the two TNF-a receptors indicated that acute filariasis and hydrocele cases are similar in termsof TNF-s receptor status. None of the studied markers differentiated microfilariae carriers (AS) from subjects with cryptic infections (CR). Both the groups were found to display elevated levels of TNF-α and TNFR-75 and decreased levels of ICAM-1 in comparison to endemic normals. The following are the broad conclusions of the study on morbidity markers:

a) Inflammatory cytokines such as IL-6, IL-8, TNF-a, TNF receptor 55 were consistently elevated in acute disease in comparison to endemic normals.
b) Hydrocele cases were similar to patients with acute disease in terms of elevated levels of TNF-R55 and decreased levels of TNF-R75, and conversely
c) Elephantiasis patients and asymptomatic subjects with active filarial infection are similar viz., with elevated TNF-R75 and decreased TNF-R55,
d) Significantly raised IL 6 levels were observed only in acute cases and elophantiasis patients in comparison to other groups.

3. Identification of novel recombinant antigens for diagnosis of infection and disease:

The availability of the following filarial recombinant proteins has allowed us to address the issue of using antibody responses as a marker of morbidity in different clinical categories of human filariasis. Antibodies to the following recombinant proteins were quantified: 1) Abundant larval transcript-1; ALT-1; 2) ALT-2; 3) Serpin-2 (SPN-2) and 4) Cystein proteinase inhibitor-2 (CPI-2) The first two are molecules produced essentially by infective larval stages, while SPN-2 is synthesized only by microfilarial stages and CPI-2 is present on the surface of adult filarial worms. IgG antibodies to ALT-1 were significantly more in subjects free of patent infection (without circulating filarial antigen, (CFA) as compared to those who were displaying antigenemia. More significantly, an inverse association was observed between filarial antigen units and the IgG antibody levels to ALT-1. These observations clearly indicated a role for IgG antibodies to ALT-1 proteins in restricting the infection load in human Bancroftian Filariasis. This notion is further strengthened by antibody titres in age-stratified endemic population- a progressive increase of anti-ALT-1 IgG was observed with increasing years of exposure to infective larvae in the endemic population. Recombinant proteins ALT-1 and ALT-2 were further used to quantify specific IgG sub-groups reactivity in four different categories of human filariasis. The findings revealed a critical role played by these two dominant larval specific antigens. Enhanced IgG1 to ALT-1 was associated with active infection while enhanced IgG2 to ALT-1 was associated with development of pathology. Interestingly IgG3 ALT-1 was found to be significantly more in subjects with cryptic infections as compared to Mf carriers and levels of IgG4, (considered to be elevated in the infected population when tested using crude filarial antigens) was not found to be significantly different in the four clinical categories. The IgG sub-groups reacting to ALT-2 were different from that of ALT-1 described above. Significantly elevated IgG1 was observed in endemic normals in comparison to Mf carriers and IgG3 to ALT-2 was found to be significantly more in patients with chronic disease and there was no significant difference in IgG4 levels reacting to ALT-2 in various clinical groups.

IgG levels to recombinant CPI-2 (an antigen present on the surface of adult worms) were significantly more in cryptic cases (CR) in comparison to Mf carriers. This indicates a role for this antibody in anti-microfilarial immunity since CR are free of circulating Mf but harbor adult filarial worms. Further, IgG levels to recombinant SPN-2, (an antigen present in microfilarial stages) were significantly more in endemic normals (EN), chronic cases (CH) and in subjects with cryptic infections (CR) in comparison to Mf carriers. This indicates a role for antibodies to SPN-2 in anti-microfilarial as well as anti-adult immunity. More interestingly, the higher levels observed in CH cases as compared to endemic normals indicates that very high antibody response to SPN-2 could be associated with pathology.

All the technical components of the project have been successfully undertaken so far as per the original project proposal. The study has identified markers of morbidity for different clinical categories of human lymphatic filariasis.

3.4 Role of IgA in Protective Immunity in Human and Experimental Filariasis

Status :
ICMR Intramural Project

Investigators :
Dr. B. Ravindran, P.I., Dr. A.K. Satapathy, Dr. P.K. Sahoo, Dr. M.C. Mohanty, Mr. B.R. Sahoo

Starting date : January 2002

Closing date : December 2004

Objectives:

1. To correlate filarial IgA levels with clinical spectrum of Filariasis.
2. To correlate Filarial IgA levels with gender and duration of exposure to infection.
3. To identify by immunochemical analysis IgA inducing filarial antigens using as probes sera of putatively immune subjects.

Background:

Definition and demonstration of protective immunity in human filariasis has been a contentious issue. While several investigators have presumed absence of infection as an indicator

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of 'protective immunity', genuine immunity needs to be considered as a state associated with absence of infection as well as disease. Endemic normals (EN) are considered putatively immune since they are free of infection as well as disease although clear delineation of EN (asymptomatic, amicrofilaraemic subjects without demonstrable antigenemia) has been possible only in Bancroftian Filariasis since immunoassays for detection of CFA are not currently available for Brugian Filariasis. Immune response phenotype characterized by increased filarial specific T-cell proliferation, IFN-γ, IL-5 production, presence of antibodies to sheath, and raised levels of IgE, IgG1, IgG2 are consistent features observed in patients with chronic disease as well as in Endemic normals. The current study is the first attempt to quantify filarial IgA and characterize protective immunity in clearly delineated clinical groups based on presence or absence of disease as well as infection. Our results suggest a role for IgA in limiting filarial infection as well as in induction of pathology in human filariasis.

Summary of Observations and Conclusions:

The results showed significantly decreased levels of total serum IgA antibodies in asymptomatic carriers as compared to other three groups viz., people with chronic disease, and in subjects with cryptic infections and putatively immune subjects. Since microfilaremic subjects were found to possess lower levels of total IgA , it was of interest to investigate if this is related to infection load. Since both Mf as well as CFA levels can be quantitatively estimated, an attempt was made to correlate the total IgA levels to infection load. No significant association between the levels of Mf and CFA indicating that the decreased total IgA observed in microfilaremic subjects in independent of infection intensity.

The sera were tested for reactively to a solubilized adult worm extract (Fil.Nat) and probed with different second antibody conjugates. There were no significant differences between the two groups when probed with anti-human Ig (polyvalent), anti-human IgG or anti-human IgM conjugates. However filarial IgA was found to be significantly more in EN category in comparison to CH cases. Increased IgA levels were found to be an unique feature of only EN cases since the other three clinical categories viz., mf carriers, patients with chronic disease and subjects with cryptic infection were found to have comparable levels of IgA and the levels in EN were significantly more than the other three groups. Since these observations were novel and have not been recorded earlier, it was of immediate interest to investigate if the IgA are directed towards protein (Fil.Pro) or carbohydrate (Fil.Cho) epitopes of adult stage filarial parasites. Similar reactivity to Fil. Pro and Fil.Cho was observed indicating that filarial IgA are directed towards both protein and carbohydrate epitopes.

When the sera samples were classified according to infection status disregarding presentation of symptoms, subjects with current infection (as shown by presence of Mf and/or CFA) were found to posses significantly less filarial IgA compared to those without active infection. More interestingly, when the sera were classified according to presence/absence of infection and disease, significantly more IgA antibodies were found in females than in males in each of the three categories. A semi-quantitative estimation was done for IgA to sheath in three clinical categories of human Filariasis, namely asymptomatic microfilaremics, people with chronic disease and putatively immune subjects. The percentage of asymptomatic carriers demonstrating IgA reactivity to sheath was significantly less in comparison to patients with chronic disease and endemic normals.

Analysis of 218 sera collected from all age groups indicated that levels of Filarial IgA appearing in younger age groups (<20 years) are sustained and persist without any significant change in all the higher age groups. A very significant direct association was observed between IgA levels and absolute eosinophil counts. An attempt was also made in to quantify the IgA antibody response against recombinant filarial antigens viz., Bm-ALT-1 , ALT-2, CPI-2, SPN-2 and VAL-1 across the clinical spectrum of human filariasis. Significantly higher levels of IgA antibodies to Bm-ALT-1, Bm-ALT-2 and Bm-VAL-1 were observed in subjects with cryptic infections as compared to Mf carriers. The IgA levels were found to be significantly high in cryptic cases as compared to people with chronic disease , when tested against Bm-ALT-2. No significant difference was observed in levels of IgA among the clinical categories to Bm-CPI-2 and SPN-2 antigens. Since, ALT-1, ALT-2 and VAL-1 are proteins largely secreted by third stage larvae of *B.malayi* and not by other

developmental stages of parasites, the higher levels of IgA antibodies to these three recombinant antigens in subjects with cryptic infections as compared to Mf carriers suggests a possible role of the isotype of antibodies in mediating anti-larval immunity in filariasis.

3.5 Assessment of therapeutic efficacy of chloroquine in treatment of uncomplicated *P.falciparum* malaria in M.Rampur block of Kalahandi district, Orissa.

Status :
Extramural (EMCP, Department of Health & Family Welfare, Govt. of Orissa

Investigator :
Dr. A.S. Kerketta

Starting date : February 2005

Closing date : March 2005

Background:

With request from state health department EMCP during February 2005, the pilot project was initiated in M. Rampur CHC of Kalahandi district as identified by state health department.

Objectives:

1. To study the therapeutic efficacy of chloroquine (CQ) in the treatment of uncomplicated *P. falciparum* malaria.

Health facility in the study area:

There is only one CHC located at block headquarters of M Rampur block. Besides this, there are 12 Sub centers with 221 DDCs, 83 FTDs, and one malaria clinic. In addition there is an Ayurvedic health center at Urladani gram panchayat. One mobile heath unit regularly visits the selected villages as difficult area of the block at least once in a month. A total of 36 health workers are there in the different villages who take care of the immunization and malaria related work.

Malaria situation of M. Rampur CHC:

The last three years data on the malaria situation of the M. Rampur CHC indicated an increasing trend of the disease. The SPR increased by 6.6% from 2002 to 2004. The Plasmodium falciparum (pf) rate accounts more than 80% in the area. It has gone up from 72.7% to 85% from 2002 to 2004. High SPR (more than 5%) is indicative of high transmission, and ABER is more than 10 indicate needs for proper surveillance in this area. The detail data on malaria situation of the CHC is given in Table-1.

Table 1. Malaria situation according to previous three years CHC data

Year	2002	2003	2004
ABER	28.8	30.9	32.8
SPR	8.3	8.9	14.9
SFR	6.0	7.5	12.7
Pf%	72.7	83.8	85
Total population	63608	63608	68687
BSE	18333	19694	22244

Study Villages:

The study was undertaken in 10 villages under 3 Gram Panchayats (GP) of the CHC. After liaisoning with the ADMO (PH) and with the CHC Medical Officer (in-charge) the high malaria risk villages were selected based on the earlier CHC data and the experience of treatment failure by the CHC staff. The villages are surrounded by the inaccessible mountains in the east, south and north. In the west lies the Rahul river. During monsoon, the area remains cut off from other areas. The villages of other two GPs are in the foothills of hilly mountain but lies beside/nearer to the main road. The population of the study villages under Urladani subcentre is 789 and the of the village under Dhenkenkupa GP is 176 & village under Gocchha-danger GP was 1504. Thus a total of 2,469 population covered during the study period.

Materials and method:

Sample size:

The sample size for study of efficacy of CQ was calculated as per WHO guideline for estimating the population proportion (WHO 2001). The known treatment failure in the study district as per earlier report is 10-12%. With anticipated population proportion of treatment failure (P)

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15% at 95% confidence interval and precision (d) 10% & brusing sample size determination table the sample size comes to 49. With the anticipation of drop out of 10%, the total sample of 53 cases were included in the study.

Characteristics of sample:

Study populations are the cases frankly presenting with fever and that showed parasitaemia with *P. falciparum* mono infection and with a density of 1000-100,000/ µl of blood.

Box-1

Inclusion criteria:

1. All patients more than 5 years age and of both sex
2. All positive for *P. falciparum* mono infection cases with parasite density of 1000-100000-parasite/µl of blood
3. History of fever during the present illness
4. Axillary temperature <39.5 degree centigrade
5. Ability to come for the stipulated follow up visits and easy to access to health facility
6. Informed consent by the patient or by parent/guardian for children

Exclusion criteria:

1. One or more of danger signs or any signs of severe and complicated malaria
2. Presence of severe disease
3. Presence of severe malnutrition.
4. Pregnancy

Danger signs:

a. Not able to drink or feed
b. Repeated vomiting
c. Convulsions during present illnessd, lethargic or unconsciouse, unable to sit or stand up

Drug administration schedule:

Chloroquine-1500mg base (adult dose) was administered under supervision during a period of 3 days as follows

Day 0- First dose-600 mg base =4 tabs of 150 mg base each
Day 1-Second dose-600mg base=4 tabs of 150 mg base each
Day 2-Third dose-300 mg base=2 tabs of 150mg base each
Children received 10mg/kg body weight as first dose, 10mg /kg body weight as 2nd dose and 5mg/kg as 3rd dose.

Study design:

	DAYS							
	0	**1**	**2**	**3**	**7**	**14**	**21**	**28**
CQ treatment	10	10	5					
(mg/kg of body weight)								
Clinical examination	Y	Y	Y	Y	Y	Y	Y	Y
Axillary temperature	Y	Y	Y	Y	Y	Y	Y	Y
Parasitaemia	Y		Y	Y	Y	Y	Y	Y
Body weight	Y							
Y= Yes								

Study Procedure:

The therapeutic efficacy of CQ was conducted as per the WHO guideline for Assessment of Therapeutic Efficacy of Anti-malarial Drugs for Uncomplicated Falciparum Malaria (WHO 2001).

The health worker of the particular sub centre accompanied the study team. In villages a rapid fever survey was done. A careful and precise registration of address of each case was done. Taking consideration of inclusion and exclusion criteria, the eligible cases were selected for the study. Before enrolment the patient and his/her attendant was briefed in details about the aim, procedure and the benefits of the study. The informed and written consent was obtained from each subject. Thus a total of 53 subjects were enrolled in the study and followed on subsequent days. (The details of these subjects are given in Table 2).

Table 2. Age and Sex distribution of the study population

Age in years	Male	Female	Total
5-14	13(52.0)	12(48.0)	25(47.0)
15 and above	15(53.6)	13(46.4)	28(53.0)
Grand total	28(52.8)	25(47.1)	53

A careful history was taken on consumption of anti malarial drugs during the last three days prior to the present treatment. The axillary temperature was recorded with the help of an electronic thermometer and the body weight was measured with the help of a calibrated scale-weighing machine. Blood smears were collected in duplicate on the days 0, 2, 3, 7, 14, 21 and 28 of initiation of the treatment. Simultaneously the thick and thin films of peripheral smear were prepared and were air dried rapidly. The thin smear was fixed with anhydrous methanol. The smears were stained with Giemsa stain 3% and at pH 7.2 and examined on same day. The parasite count was done against 200 WBC in thick smear. Thin smears were used to confirm the parasite species. The drug Chloroquine 150 mg base (generic name Resochin, manufacturer Bayer Pharma Pvt Ltd) was administered to each patient. The drug was administered on days 0 and 1 and 2 to the patient on the spot, under supervision of the medical team. The study subjects were monitored daily by the physician daily for initial 3 consecutive days and on subsequent follow up days. They were advised not to take any other drug during the study period with out informing investigator.

Follow-up:

The study subjects were followed up with blood smear for parasite count on days 2, 3, 7, 14, 21 and 28. Besides blood smears collection the clinical examination was done on each day for recording the danger signs as shown above.

Dropouts:

Out of total study population 3 (5.6%) dropped out from the study. One case developed concomitant upper respiratory tract infection on day two, one taken treatment from third party during follow- up period and one moved to his relative's house which was outside of reach of active follow-up. Thus a total of 50 (94.3) subjects could be followed for all 28 days of study period.

The therapeutic response classification:

The therapeutic response was classified according to the WHO guideline (2001).

- Early treatment failure (ETF): Development of danger signs or severe malaria on day 1, day 2,or 3 in presence of parasitaemia;
- Parasitaemia on day 2 higher than day 0 count irrespective of axillary temperature; Parasitaemia on day 3 with axillary temperature ≥ 37.5 degree C and parasityaemia on day 3 > 25% of count on day 0
- Late treatment failure

(LTF) - 1. Late Clinical Failure (LCF)
- 2. Late Parasitological Failure (LPF)

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LCF - Development of danger signs or severe malaria after day 3 in presence of parasitaemia

- Presence of axillary temperature ≥ 37.5°C on any day between day 4 to day 28 without previously meeting any of the criteria of ETF.

LPF - Presence of parasitaemia on any of the schedule return on day 7, day 14, day 21 and day 28 with axillary temperature less than 37.5°C without previously meeting any of the criteria of ETF or LCF.

- Adequate clinical and parasitological response (ACPR)- Absence of parasitaemia on day 28 irrespective of axillary temperature, without previously meeting any of the criteria of ETF, LCF or LPF.

Results:

A total of 124 fever cases were screened clinically and all suspected malaria cases screened for malaria parasite by the ICT test i.e. SD Pf / Pv malaria kit for quick identification of mixed infection cases. Out of which 64 (51.6%) were *P. falciparum* mono infection, 4(3.2) had P.vivax mono infection, 29 (23.4) had mixed infection of *P. falciparum* as well as P.vivax infection and 27(21.8) did not have any malaria parasite infection of *P. falciparum* cases, 4 patients were excluded due to pregnancy, 2 patients had very high parasite count and was difficult to count the exact number of parasite and 5 patients had very low parasite count. The PV and mixed infection cases were treated as per the NAMP drug schedule and disposed after wards. Thus 53 cases met the criteria for inclusion was enrolled in the study. The baseline information of the study sample is given in Table 3.

Table 3. Mean and range of baseline information of study population

	Mean	Range
Age	21.2830	5 - 65
Axillary Temp	37.9321	37.5 – 39.4
ParasiteCount on Day 0	4931.32	1080 - 19980

The data obtained from the study shows that, out of 50 patients who continued till the end of the study, only 3 (6.0%) showed Adequate clinical and parasitological response (ACPR), 8 (16%) showed early treatment failure (ETF), of which one case (2%) developed danger sign on second day and had repeated vomiting, lethargic and unable to sit or stand up and 7 (14.0%) had parasitaemia more than day 0 on day 2. Late clinical failure (LCF) was marked in 1 case (2%) who developed fever on day 28 and had axillary temperature of 39.4 degree centigrade which is more than 37.5 degree centigrade. A total of 38 (76%) had late parasitological failure (LPF) of which 30 (79.0%) had parasitaemia on day 7, 2 (5.3) had parasitaemia on day 14, 5 (13.1%) had parasitaemia on day 21 and 1 (2.6%) had the parasitaemia on day 28 (Fig. 1 and Table 4). Thus around 94.0% patients in the study showed treatment failure with CQ.

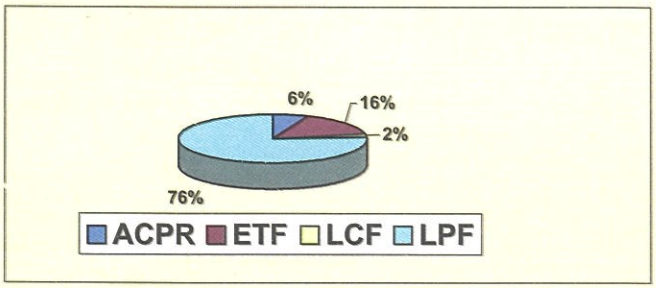


Fig. 1. TRERAPEUTIC RESPONSE TO CQ

Table 4. Drug response on parasite count

Base level	Nos.	Range	Mean
Day 0/1	50	1080-19980	4931.32
Day 2 ETF	8	1320-22880	6825
Day 7 LTF	30	280-8720	2183.33
Day 14 LTF	2	240-580	410
Day 21 LTF	5	120-1360	644
Day 28 LTF	1	560	560

Conclusion:

The present study has unveiled a starting situation of CQ resistance in M. Rampur block of Kalahandi district. Never before such reports of such a high percentage of resistance has been reported from Orissa. The result of the study pertaining to 10 villages has revealed that, the first line drug CQ is only 6% effective and the treatment failure rate is as high as 94%. This situation warrants a change to the second line of drug Sulfadoxine-Pyrimethamine in this area. However a single report from a small area like this seems insufficient to change over the drug policy. Therefore more such studies should be undertaken intensively in this area as well as other area to identify and delineate such pockets of CQ resistance in the state. This is a continuous process, since the parasite resistance to this drug is a dynamic process and takes place in nature by natural mutation. Therefore the continuous monitoring of CQ resistance in the state can't be over emphasized. This study would be a step towards the promoting evidence based action against the dreaded disease malaria.

3.6 Evaluation of the programme for the insecticide treated bed net and entomological studies for malaria control in three districts (Nawapara, Kandhamal and Kalahandi) of Orissa

Status :
Extramural Project (Enhanced Malaria Control Programme, Department of Health & Family Welfare, Govt. of Orissa)

Investigators :
Dr. R.K. Hazra

Starting date : February 2005
Closing date : March 2005

Objectives:

a) Impact assessment

1. To assess preparatory activities including survey and measures for the involvement of Panchayat Raj Institutional (PRIs), NGO and self help group (SHGs) for bed net impregnation.
2. To access training and IEC activities.
3. To access the willingness of the community to pay for the insecticide.
4. Operational detail of camp organized for treatment of nets.
5. Action taken for the procurement of insecticide for treatment of the nets.
6. Coverage level achieved.
7. To access the involvement of PRIs/NGOs.

b) Vector assessments

To identify malaria vectors and its species complexes, bionomics, feeding and susceptibility status in 3 identified districts of Orissa.

Results:

Our observations as per terms of references are as follows:

The preparatory activities regarding distribution of insecticide treated mosquito nets were initiated by the District Malaria Control Society under Zilla Swasthya Samity.

Completed Projects

Distribution and impregnation of mosquito nets

Kandhamal district:

The district has been provided with 20,000 mosquito nets and 200 litres of Deltamethrine 2.5% flow as1st lots on 18.2.03 and 250 litres in 2nd lot on 7.6.04 for re-impregnation of the net. As per the decision of Zilla Swasthya Samiti meeting held on 18.8.03, it was proposed to provide the medicated mosquito nets to the boarder of Ashram school hostel at the cost of Rs.10/- per net, to population of below poverty line of three highly malaria prevalent blocks, i.e. Daringbardi, Subarnagiri, Tumudibandha at the cost of Rs.20/- per net and to others at the cost of Rs.30/- per nets. As limited numbers of nets were actually received, it was decided in block level meeting to distribute them in villages with high incidence of malaria, which was identified by Block Chairman and other PRI members For Ashram School hostels, Project Administrator, ITDA, Phulbani and ITDA, Balliguda informed about their requirement. The required numbers of nets were medicated at District headquarters and then were supplied to the respective ITDAs. The number of nets for the three blocks as decided by the Zilla Swasthya Samiti were provided to the respective Medical Officer-in-charge for impregnation and distribution. Limited number of nets were received, it was distributed in villages of 3 block with high incidence of malaria as identified by Block Chairman and other PRI members. 7000 nets were distributed in Daringbadi CHC, 3000 nets were distributed in Tumudibandh PHC and 4527 nets were distributed in Subarnagiri PHC. The rest nets were distributed in ITDA, Phulbani and ITDA, Balliguda (Table-1). In Kandhamal district 250 litres of Deltamethrine 2.5% was supplied on 7.6.04. Community awareness camp was organized on 20th and 21st of December 2004. In January 2005, 70lts of flow was supplied to Daringibadi, 30 litres to Tumudibandh and 46 litres to Subarnagiri. The re-impregnation work is in progress.

Kalahandi district:

The summery of distribution of treated mosquito nets is given in Table-2. Since the number of nets in Kalahandi district available was limited, and distribution of nets were made to all the blocks hence the average distribution of net per village is only 8 to 9. Kalahandi district CDMO received 25,000 bednet in November 2002. Impregnation of the nets was done in PHCs level. Only in Th. Rampur 6850 nets were distributed and rest were distributed in all other PHCs.

In Kalahandi district, reimpregnation were undertaken from August 2004. Total 251 litres of Deltamethrine 2.5% supplied for treatment. Two NGO namely, Gramvikas and Antodaya were assigned for the reimpregnation.

Nawapara district:

Nawapara district received 25,000 beds net from EMCP. The ZSS meeting held on 19.8.02 decided to distribute the mosquito nets to APL and BPL cardholders at the cost of Rs.30 and Rs.20 respectively. The nets were supplied to PHC medical officer and the PHC medical officer as per instruction of collector handed over the nets to Sarapanch. The Sarapanch redistributed the nets to Ward members, who distributed in the village. The distribution of bed nets is depicted in Table-3.

In Nawapara district, reimpregnation started from 10.3.05. Here two NGOs namely Srusti and Parda are involved. 300 litres of flow received on 8.7.04. The work of reimpregnation is in progress. The team visited to different villages where reimpregnetion has just started.

Training:

The district authority organized training for health worker of 3PHCs in Kandhamal, 13 PHC in Kalhandi and 5 PHC in Nawapara. This training was meant for health workers (male and female), Anganwadi workers and Volunteers, who were engaged in impregnation work, doctors and other paramedical staffs. The training programme was also organized for PRIs workers. District authority like ADMO and PHCs doctors organized the training for medical officer and PHC staff and PHC staff trained the other workers. Adequate IEC

campaign has been made for motivation of community. In Kandhamal district the district health authority organized community awareness camp in different PHCs. In Kalhandi district by the help of health worker they have conducted a survey for community own net impregnation. They have target of 5000/nets per block.

Evaluation of Bed net distribution and coverage:

In Kandhamal district, in 3 PHCs, bed net was distributed and in Daringbadi where population is 91155 only 7000 bed nets was supplied that comes to 7.6% of the population. In Tumudibandh PHC having population of 49781 received 3000 bed nets (6%) and Subarnagiri PHC received 3000 bed nets where the population is 41650, (7.2%). In all these three PHCs, mosquito bednets were supplied to high malaria endemic villages. Nearly 95% coverage was seen in the villages where the net was supplied. The rest 5% did not received the bednets as they were not available during the time of distribution. The team visited a total 19 villages of three PHC. In each village it was observed that nearly all household received bednets, around 50 % household received one net per family, 43% received two nets, 7.7% received 3 net and rest more than three nets. We observed that while 85% of the population makes regular use of bed nets, 15% kept them for use in rainy season when the mosquito density will increase. People were happy about the distribution of the nets and many have told about collateral benefit.

In Kalahandi district, a rapid sample survey for ascertaining net distribution, re-impregnation, usage and community response was carried out by the evaluation team. This was undertaken in randomly selected villages of in 3 districts and 42 villages where treated nets had been distributed. 241 houses were surveyed in Kalahandi district, which covers 21 villages under 5 PHCs (M. Rampur, Narla, Parla, Pastikudi, and Th. Rampur). Here, the treated nets had not been distributed to every family of the village. Average net distribution per village surveyed was 12. Few families received the nets out of which 89% received one net and 11% received more than two nets. Out of 251 respondent received net, 92.5% were using the mosquito net regularly. Through organizing Focus group discussion (FGD), with the villagers, it was learnt that the community has a fair knowledge about malaria transmission, mosquito-breeding sites, since the number of nets had limited availability and accordingly distribution pattern could not be homogeneous, few people expressed unhappiness for not been distributed nets indicating their eagerness to accept. The persons those received the bed net have told about the collateral benefit of using insecticide treated nets i.e. it also kills the head lice and other insects. They expressed their positive attitude towards procuring nets. None of the respondents using treated mosquito nets has reported any adverse effect.

In Nawapara district, an average of 200-300 net were distributed per Panchayat and 20/30 nets was distributed per ward. Our team visited 12 villages of two PHCs. It was observed that 188 families received the bednet. Nearly 93% of families received one net and rest (7%) received 2 net per family.

Entomological survey:

Vector prevalence: The distribution pattern of Anophelines vector in three districts is depicted in this report (Table 4-6). Ten species of Anophelines have been identified in the present survey. Among ten species of Anophelines, 3 were identified as vectors viz. *An. culicifacies, An. fluviatilis* and *An. annularis*. All the species collected both from human dwelling and cattle shed except *An. Fluviatilis,* which were collected only from human dwelling. *An. culicifacies* and *An. annularis* mainly found in the cattle shed .*An.culicifacies* and *An.annularis* were known to be endophilic, endophagous in nature whereas *An. fluviatilis* was endophagus but exophilic in nature.The abdomen of all the species showed half gravid and full fed.

In Kandhamal district mosquitoes were collected from 8 villages of 4 PHCs. A total of 452 mosquitoes were collected, out of which 391 (86.5%) are Anophelines mosquitoes and rest are culex. Out of 391 Anophelines collected 162 (41.4%), 5 (1.3%) and1 (0.17%) are *An. culicifacies* , *An. fluviatilis* and *An.annularis* respectively. (Table-4)

Completed Projects

In Kalahandi district mosquitoes were collected from 27 villages of 5 PHCs. A total of 1897 mosquitoes were collected from the district out of which 1395 (73.5%) were Anophelines mosquitoes and the rest are culex. Out of 1395 Anophelines collected 33 (2.4%), 221 (15.8%) and 1 (0.07%) were *An. annularis*, *An. culicifacies* and *An. fluviatilis* respectively (Table-5).

In Nawapara district mosquitoes were collected from villages of 3 PHCs. A total of 697 mosquitoes were collected out of which 587 (84.2%) were Anophelines mosqultoes. Out of 587 Anophelines mosquito collected 4 (0.68%) and 113 (19.25%) was *An. annularis* and *An. culicifacies* respectively (Table-6).

In Kandhmal PHC among the vectors An.culicifacies was predominating. Average per manhour density of An.culicifacies was found to be 19.5 which is higher and it was more than the critical density (PMHD - 3.3). Here only two *An. annularis* were found. Maximum number of mosquitoes collected were half gravid and gravid which denotes that these species are endophilic in naturc. In Kalahandi district, the density of *An. culicifacies* was more among the vectors. The average PMHD was found to be 2.78. In Nawapara also similar type of distribution was observed and the PMHD was 4.65.

Anthropophilic index of *An. culicifacies, An. annularis*. and *An. Fluviatilis:*

Precipitin test for blood meals of *An. culicifacies* and *An.fluviatilis* was carried out by gel-diffusion technique. The anthropophilic index of *An. culicifacies*, *An. fluviatilis* was found to be 7.5% and 50% in Kandhamal district. In Kalahandi district it was 13.3% and 9.2% for *An. annularis* and *An. culicifacies* respectively in Nawapara district the anthropophilic index of An. culicifacies was 8.3% (Table7).

Susceptibility status of *An. culicifacies* in 3 districts of Orissa:

The result reveals that in Kandhamal, Kalahandi and in Nawapara district *An. culicifacies* found to be resistant to D.D.T. where as they are highly susceptible to Deltamethrine (Table-8).

Conclusions:

From our study to evaluate bednet distribution and vector study, it was observed that very limited numbers of bednets were supplied in these three districts, i.e. Kandhamal, Kalahandi and Nawapara. ITMN programme in Kandhamal district has been very well accepted by the community (where it is distributed) as evident from the high rate of mosquito net usage and people's preference to treated mosquito nets In Kalahandi and Nawapara district the distribution of mosquito nets were made in all the PHCs. The distribution pattern was in a scattered manner; hence the total population of PHC could not be covered. It was distributed in all the PHCs, and each Panchayat received around 200-300 nets in Nawapara and 100 net in Kalahandi. So each ward received only 20-30 bednets in Nawapara and 10-15 in Kalahandi district. Since the distribution of net did not cover all the house holds of Kalahandi and Nawapara districts hence the assessment of efficacy of treated nets at community level is not comparable to that of Kandhamal, where complete coverage was made in the selected villages.

As no base line survey report is available for either of the three districts, periodical entomological and epidemiological surveys should be done to know the effect of bednet on malaria transmission.

Retreatement of net has started in Kandhamal and Nawapara but in Kalahandi due to charges of re-treatment, the community acceptance was very low. The FGDs undertaken indicated that people were eager to buy the nets with subsidized prices and use them. Large proportion of people understands the purpose of nets and its use but awareness is required to get optimal utility of nets. In the present survey three major vectors of malaria viz. *An.fluviatilis, An.culicifacies* and *An annularis* were found to be prevalent in Kalahandi, Nawapara and Kandhamal districts. The density of *An.culicifacies* is more in Kandhamal and Nawapara districts.*An.culicifacies* found to be susceptible to synthetic pyrethroid and resistant to DDT. As the collection was done in summer season the number of *An.fluviatilis* collection is very less so the susceptibility status of *An. fluviatilis* could not be done.

Table 2. PHC wise distribution of mosquito bednets and 2.5 % deltamethrine flow for 2004-2005 in Kalahandi district

Sl. No.	Name of the PHCs	Number of mosquito bed net already supplied	Quantity now supply of Deltamethrine 205 % in litre (one bottle =1 litre)	Remarks
1	Th.rampur	6,850	69	75Km
2	Chilliguda	2,000	20	45
3	Jaipatna	2,000	20	75
4	B.N.Pur	2,000	20	45
5	M.Rampur	2,150	22	45
6	Borda	1,500	15	Impregnation report submitted
7	Parla	1,000	10	
8	Karlakudi	1,000	10	
9	Pastikudi	1,000	10	Impregnation report submitted
10	Chapur	1,000	10	
11	Narla	2,000	20	35
12	kalampur	500	5	Impregnation report submitted
13	Koksara	2000	20	
	Total	**25,000**	**251**	

Table 3. Mosquito net distribution in Nawapara district

Sl. No.	Name of PHC	Total number of mosquito nets supplied	Date of supply
1	Sinapali	3000	Sept – 2002
2	Boden	3000	Sept – 2002
3	Kharion	4000	Sept – 2002
4	Komna	7000	Sept – 2002
5	Khariontood	7000	Sept – 2002
6	Reserve for H.Q.	1000	Sept – 2002

Table 4. Entomological report of Kandhamal district during March 2005

Sl. No.	Name of species	PHC									
		Khajuripada (1 Village)		Gumagada (1 village) 1		Daringbadi (4 villages)		Subarnagiri (4 villages)		Tumudibandh (1 village)	
		No.	PMHD	No.	PMHD	No.	PMHD	No.	PMHD	No.	PMHD
1	*An. annularis*									2	0.17
2	*An. culicifacies*	4	1.0	69	86	64	4.57	5	1.0	74	6.17
3	*An. fluviatilis*	-	-			5	0.35	-	-	1	0.08
4	*An. subpictus*	8	2.0	-	-	33	2.35	51	10.2	38	3.17
5	*An. splendidus*	-	-	-	-	4	0.28	-	-	16	1.33
6	*An. vagus*	7	1.75	17	2.1	61	4.35	61	12.2	81	6.75
7	*Cx. vishnui*	-	-	-	-	2	0.14	13	2.6	28	2.33
8	*cx. quinquefasciatus*	14	3.5	-	-	5	0.35	27	5.4		

Completed Projects

Table 5. Entomological report of Kalahandi district during March 2005

Sl. No.	Name of species	PHC									
		Pastigudi (6 Village)		Parla (3 village)		Th. Rampur (6 villages)		Narla (4 villages)		M. Rampur (8 village)	
		No.	PMHD	No.	PMHD	No.	PMHD	No.	PMHD	No.	PMHD
1	***An. annularis***	4	0.4	2	0.33			6	0.35	21	0.91
2	*An. aconitus*							5	0.29	1	0.04
3	*An. culicifacies*	11	1.1	10	1.66	16	2.0	76	4.470	108	4.69
4	*An. fluviatilis*			1	0.16						
5	*An. hyrcanus*	7	0.7	5	0.83					19	0.82
6	*An. jeyporjensis*	1	0.1	-	-	-	-	-	-		
7	*An. subpictus*	81	8.1	90	15.0	66	8.25	167	9.82	165	7.17
8	*An. tasselatus*	1	0.1	2	0.3						
9	*An. vagus*	65	6.5			102	12.75	199	11.70	162	7.04
10	*Cx. quinquefasciatus*	33	3.3	19	3.16	47	5.87	7	20.41		
11	*Cx. vishnui*	29		27	4.5	131	16.37	115	6.76	94	4.08
12	*Cx. tritaeniorhyncus*	1	0.1								

Table 6. District wise entomological report of Nawapara district

Sl. No.	Name of species	PHC					
		Khariar (3. villages)		Sinapali (2 village)		Khariar road (2 village)	
		No.	PMHD	No.	PMHD	No.	PMHD
1	*An. annularis*	4	0.44	-			
2	*An. culicifacies*	12	1.33	101	12.62	-	
3	*An. subpictus*	76	8.44	115	14.37	-	
4	*An. vagus*	92	10.22	87	210.87	100	12.5
5	*Cx. vishnui*	8	0.89	25	3.12	74	9.25
6	*cx. quinquefasciatus*	3	0.33	-	-	-	-

Table 7. Anthropophilic index of *An. culicifacied, An. fluviatilis and An. Annularis*

Area	SP species	No. of tested	Number of positive for Human	% Human
Kandha	An. Culi	53	4	7.5
Kandha	An. fluviatis	4	2	50
Nuapada	An. culi	60	5	8.3
Kalahandi	An. ann	15	2	13.3
Kalahandi	An. cul	65	6	9.2

Table 8. Susceptibility Status of *An. culicifacies* (vector of malaria) in three districts of Orissa

Sl. No.	Name of the District	Name of the PHC/Village	Anopheles species tested	Insecticide	Death of Mosquito				% of control mortality	% of test mortality	Corrected mortality
					Control		Test	Dead/Alive			
					1 hr.	24 hrs.	1 hr.	24 hrs.			
1	Kalahandi	NARLA/BURAT, Talapada	*An. culicifacies*	DDT4%	Nil	Nil	Nil	3/15	Nil	20%	20%
			An. culicifacies	Deltamethrin 0.05%	Nil	Nil	15/15	-	Nil	100%	100%
2	-DO-	M.RAMPUR/ Ambagan,Tujung	*An. culicifacies*	DDt4%	Nil	Nil	Nil	4/15	Nil	26.6%	26.6%
			An. culicifacies	Deltamethrin 0.05%	Nil	Nil	14/15	1/15	Nil	100%	100%
3	Kandhamal	Tumudibandh/ Guma,Bilmal	*An. culicifacies*	DDT4%	Nil	Nil	Nil	2/15	Nil	13.3%	13.3%
			An. culicifacies	Deltamethrin 0.05%	Nil	Nil	14/15	1/15	Nil	100%	100%
4	-DO-	Daringbadi/ Daringbadi,Parthamal	*An. culicifacies*	DDT4%	Nil	Nil	Nil	4/15	Nil	26.6%	26.6%
			An. culicifacies	Deltamethrin 0.05%	Nil	Nil	15/15	-	Nil	100%	100%
5	-DO-	Gumagada/ Rashmimandi	*An. culicifacies*	DDT4%	Nil	Nil	Nil	4/15	Nil	26.6%	26.6%
			An. culicifacies	Deltamethrin 0.05%	Nil	Nil	15/15	-	Nil	100%	100%
6	Nawapada	Sinapali/Badagan	*An. culicifacies*	DDT4%	Nil	Nil	Nil	3/15	Nil	20%	20%
			An. culicifacies	Deltamethrin 0.05%	Nil	Nil	15/15	-	Nil	100%	100%

Completed Projects

Status : Extramural (ICMR Taskforce)

Investigator : Dr. G.P. Chhotray

Starting date : February 2000

Closing date : January 2005

3.7 Intervention Programme for Cholera, Intestinal Parasitism, Vit A deficiency and Scabies amongst some primitive tribes of Orissa.

This community based pilot study involving 4 identified primitive tribes namely, Bondo, Didayi, Kandha and Juanga residing in 4 different geographical regions of the state was conducted in 4 phases with the following objectives:

1. A comprehensive assessment of health status and epidemiological profile in respect of cholera, intestinal parasitism, vit A deficiency and scabies will be performed in 4 identified tribes such as Bondo, Didayi , Kandha and Juanga out of 13 primitive tribes residing in Koraput, Phulbani and Keonjhar districts of Orissa.
2. Demographic profile studies reflecting the morbidity and mortality patterns arising out of these diseases and their clinical evaluation.
3. To assess the awareness of health culture and related behaviour to carry out intervention programme with a view to enhance their acceptability.
4. To plan and execute various intervention programmes among these beneficiaries with a view to augment the existing health care delivery system in those areas.
5. To formulate and develop a module with aim of educating and training the medical and paramedical workers at PHC level in health care delivery system- a future strategy for timely detection and management of these diseases.

Work done:

During the study period a total of 17 Bondo villages, 15 Didayi villages, 25 Kandha villages and 30 Juanga villages out of total 29,37, 68 and 48 villages respectively were selected for the study by using population proportion to size (PPS) sampling procedure and were enumerated. The sample size was estimated by taking the expected prevalence rate of these diseases from the Govt. of Orissa Health Statistics. The absolute number of samples was estimated from a total population of 5565, 5763, 10432 and 6624 from Bondo, Didayi, Kandha and Juanga tribes respectively by using the formula $N=\{N/2p(1-p)/E^2\}/[\{N+(t^2 p(1-p\}/E^2-1]$ with a confidence level of 95% (where N=population size, t=standard normal deviate correspond to 5% level of significance, P=prevalence rate and E=allowable error of 2%).

Since no base line data were available, a cross sectional study by way of clinical examination, laboratory investigation, enumeration and data collection was performed on 4456 number of individuals belonging to Bondo (n=1012), Didayi (1009), Kandha (1298) and Juanga (1137) (Table 1). The study revealed that majority of the people (52.6% in Bondo, 54.7% in Didayi, 46.5% in Kandha and 48.5% in Juanga) presented with anaemia as a major clinical sign followed by fever in 16.5%, 16.1%, 15.3% and 16% of cases studied in Bondo, Didayi, Kandha and Juanga population respectively. The respiratory diseases such as cough and URTI were found to be prevalent in 9.6% of Bondo, 9.7% of Didayi, 8.6% of Kandha and 9% of Juanga population studied. The diarrhoeal disorders were found to be present in 11%, 10.8%, 10.2% and 10.6% of cases of Bondo, Didayi, Kandha and Juanga study population. Amongst other infectious diseases tuberculosis, leprosy and yaws were observed to be present in only 0.6%, 1.2%, 1.2% and1.5% of cases studied in Bondo, Didayi, Kandha and Juanga tribes respectively. Hepatitis was found in 0.6% of Bondo and 0.9% of Didayi studied population and was absent in Kandha and Juanga tribes. Non-infectious diseases like cardiovascular diseases, and hypertension was found to be present in 2.3%, 2.9%, 2.6% and 2.7% of cases studied respectively. Assessment of comprehensive health status revealed that at least 34.8%, 36.1%, 37.7% and 37.8% amongst the studied population in the Bondo , Didayi, Kandha and Juanga tribes respectively had no signs and symptoms of any diseases during clinical examination.

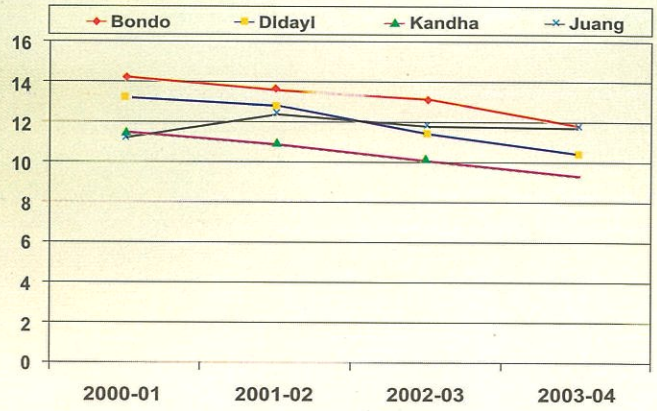
Table 1. Comprehensive health status of the studied tribes

Disease	Bondo n=1012	Didayi n=1009	Kandha n=1298	Juang n=1137
Respiratory diseases, (cough, URTI etc.)	97 (9.6)	98 (9.7)	111 (8.6)	102 (9.0)
Fever	167 (16.5)	162 (16.1)	199 (15.3)	182 (16.0)
Malaria	141 (13.9)	138 (13.7)	169 (13.0)	153 (13.5)
Diarhhoea including cholera	111 (11.0)	109 (10.8)	132 (10.2)	121 (10.6)
Cardiovascular diseases including hypertension	23 (2.3)	29 (2.9)	34 (2.6)	31 (2.7)
Other Infectious diseases	6 (0.6)	12 (1.2)	16 (1.2)	17 (1.5)
Intestinal parasitism	252 (24.9)	251 (24.9)	301 (23.2)	272 (23.9)
Anaemia	532 (52.6)	552 (54.7)	604 (46.5)	552 (48.5)
STDs & HIV	0	0	0	0
Hepatitis	6 (0.6)	9 (0.9)	0	0
Persons with no signs and symptoms of above diseases	343 (34.8)	364 (36.1)	489 (37.7)	429 (37.8)

Diarrhoeal disorders including Cholera:

There is a continuous occurrence of diarrhoeal cases in the community through out the year attaining its peak during July to October (rainy season). To identify the aetiopathogenic agents in diarrhoeal cases during the diarrhoeal episodes, stool samples/rectal swabs were collected and transported to RMRC laboratory for analysis. During the study, a total 222, 332, 276 and 236 rectal swabs / stool samples were collected in successive years (2000-01, 2001-02, 2002-03 and 2003-04) from the study populations. The bacteriological analysis revealed that 91 samples were culture positive during 2000-01, while other samples did not show any growth of enteropathogens. Amongst the culture positive cases *E. coli* was isolated in 24.6%, *Salmonella* in 2.6% & *V.cholerae* in 13.6% of samples. Amongst the *V.cholerae* isolates 10.2% were found to be *V.cholerae* 01 Ogawa and 3.4% were *V.cholerae* 0139 serotype. Amongst the pathogenic *E.coli* isolates, serological and molecular studies revealed that 6.5% were enteropathogenic *E. coli* (EPEC), 4.3% enterotoxigenic *E. coli* (ETEC) and 15.2% enteroaggregative *E. coli* (EaggEC). The incidence of diarroheal cases in subsequent years i.e. 2001–02, 2002–03 and 2003–04 remained almost same. But the isolation of *V.cholerae* as entropathogen from diarrhoea cases decreased to 0% from 4.7% during this period; where as number of *E.coli* isolates has increased from 32.5% to 41.0%.

Completed Projects



Suitable intervention during diarrhoeal outbreaks with ORS and antibiotics was implemented to cases having mild and moderate clinical signs and symptoms and hospitalization for severe cases. Community based IEC activities were conducted in all the study villages. The rectal swab analysis in follow-up studies showed remarkable decline in the isolation of *V. cholerae* from 4.7% in 2001 to 0% in 2004.

Intestinal Parasitism:

Microscopic examination of 4064 stool samples collected from 4 primitive tribes from all age/sex groups revealed that 41.6% of Bondo, 41% of Didayi, 34.5% of Kandha and 25.6% of Juanga tribe studied had intestinal parasite infection (both protozoa and helminthes). Helminthic infection was observed among 29.2%, 27.3%, 23.6% and 17.5% of Bondo, Didayi, Kondha and Juanga population. Protozoal infection (*E.histolytica* and Giardia) was observed in 12.4%, 13.3%, 10.9% and 8.1%, respectively in above communities. Hook worm was found to be the commonest helminthic infection accounting for 17.9% in Bondo, 13.7% in Didayi, 14.8% in Kondha and 10.3% in Juanga population, followed by round worm in 8.6%, 9.5%, 6.8% and 5.8% of cases. Amongst the protozoal infection *E. histolytica* is the commonest infection (7.8% in Bondo, 7.4% in Didayi, 8.8% in Kandha and 6.1% in Juanga), where as Giardia was found in 4.5%, 5.6% 2.1% and 3.1% of Bondo, Didayi, Kandha and Juanga tribes respectively. Repeated stool examination after appropriate intervention of antiprotozoal (Metronidazole 400 mg tds for 5-7 days to adult and 200 mg tds to children 5-7days) and antihelminthic treatment (Albendazole 400mg to adult, 200mg to children in single dose) in selected individuals revealed significant decrease in worm burden in the follow-up study. The worm burden has decreased from 41% to 27.2% in Bondo, from 41% to 26.6% in Didayi, from 34.5% to 22.1% in Kandha and from 25.6% to 16.6% in Juanga (Fig. 2 and 3).

Fig.2. Initial follow-up of protozoal infection

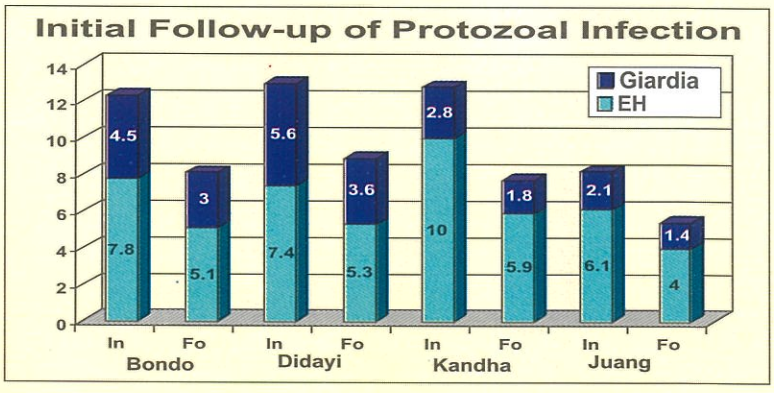
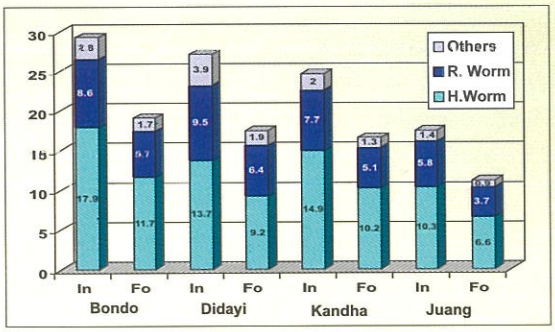


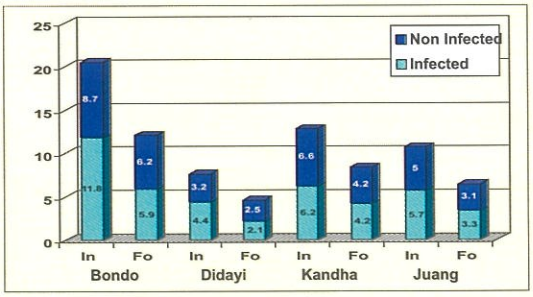
Fig.3. Initial follow-up of heiminthic infection



Scabies:

The clinical examination performed in 4,064 number of tribal population in all age/sex groups among 4 primitive tribes revealed that 20.5% in Bondo, 7.5% in Didayi, 12.9% in Kandha and 10.7% in Juanga tribe had scabies of which 11.8%, 4.3%, 6.5% and 5.5% were infected and 8.2%, 3.2%, 6.7% and 5% were non-infected. The majority of patients showing scabies were in <14 years of age group. With the institution of appropriate intervention (Benzyl Benzoite 12.5% emulsion), personal hygeine and IEC activities, the incidence dropped to 12.1%, 4.6%, 8.5% and 6.4% in Bondo, Didayi, Kandha and Juanga respectively (Fig 4).

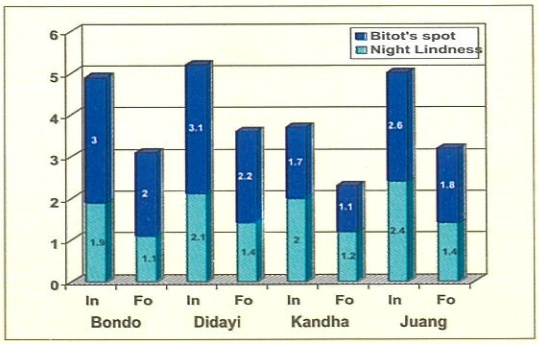
Fig.4. Initial follow-up of scabies



Vitamin A deficiency (VAD):

The prevalence of VAD among pre-school and school going children (6-14 years) by examination of signs/symptoms such as night blindness and bitot's spot during both initial and follow-up after appropriate intervention has been depicted in Fig 5. When reassessed the VAD have reduced from 8.5%, 7.3%, 5.8% and 6.4% to 5.9%, 6.2%, 3.8% and 4.5% in 0-6 years of age group and from 6.1%, 5.1%, 6.1% and 5.5 to 3.8%, 4.0%, 3.5% and 3% in 6-14 years of age group in Bondo, Didayi, Kandha and Juanga respectively.

Fig. 5. Initial follow-up of vitamin-A deficiencies



Completed Projects

Conclusion:

The study revealed that the health status of the studied primitive tribes is poor in comparison to national health status due to isolation, remoteness, lack of health care delivery and ignorance. The diseases studied like cholera, scabies, intestinal parasitism and VAD are preventable in nature after suitable and timely intervention with appropriate therapy. Therefore, a timely intervention, social awareness, health education, IEC activities will promote good health in these primitive tribal communities and reduce morbidity and mortality.

Status : Extramural (ICMR Task Force)

Investigators : Dr. G.P Chhotray, Dr. Deepika Mohanty

Starting date : October 1999

Closing date : September 2004

3.8 Intervention programme on nutritional anaemia and haemoglobinopathies in some primitive tribal population of India.

This is a community based multicentric study undertaken in 4 states (Maharastra, Gujurat, Tamilnadu and Orissa). In Orissa the study was undertaken in 4 primitive tribes viz. Bondo, Didayi, Kandha and Juanga in 3 phases with the following objectives.

1. To find out the prevalence and aetiology of nutritional anaemia and haemoglobinopathies in 4 primitive tribes viz. Bondo, Didayi, Kandha and Juanga.
2. Clinical evaluation, management and monitoring of detected cases of anaemia and haemoglobinopathies.
3. To provide necessary supplementary intervention programme for formulating the future strategies of education and training to the doctors at the PHC level.

Detailed clinical examination and laboratory investigations have been performed on 962, 1014, 953, and 1065 individuals of all age group and either sex, out of 4010, 2792, 3378 and 5535 population enumerated amongst Bondo, Didayi, Kandha and Juanga primitive tribes during the study period

The overall prevalence of anemia was observed to be 53.1%, 60.5%, 52.1% and 44.6% among Bonda, Didayi, Kondha, and Juanga populations respectively. The severity of anaemia was graded as mild, moderate and severe according to haemoglobin level following the WHO classification, in different age and physiological groups. During the initial study period, it was observed that 48.2% of the studied population had normal Hb (Hb >11g/dl), 1.6% had severe anaemia (Hb<7g/dl), 39.4% had mild anaemia (Hb 9-11g/dl) and 10.6% had moderate anaemia (Hb 7-11g/dl) in Bondo, Didayi, Kandha and Juanga primitive tribes.

The tribe wise distribution of anaemia is shown in Fig 1(a-d). Various laboratory investigation such as Hb, MCV, MCH, MCHC, FeP estimation and peripheral smear examination revealed that 61.4% of the anaemia cases had microcytic hypochromic blood picture indicating iron deficiency anaemia.

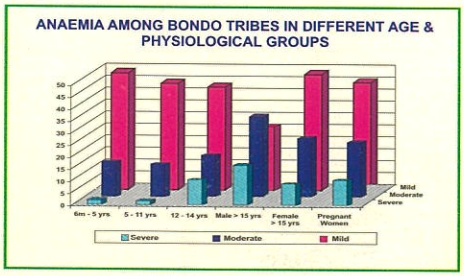


Fig. 1 (a)

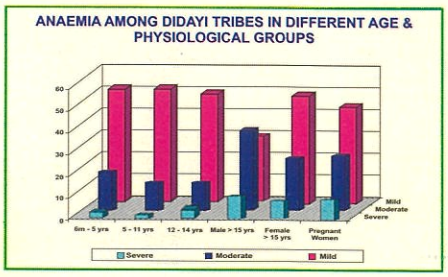


Fig. 1 (b)

Rapid diagnostic tests like NESTROFT, Hb electrophoresis, solubility test for sickling, Hb F and A_2 estimation, Hb variant analysis (BIORAD) revealed that 0.7%, 3.2%, 1.2%, 2.7% of the studied population of Bondo, Didayi, Kandha and Juanga primitive tribes respectively had sickle cell disease of which 0.1% are sickle cell anaemia (HbSS) and rest of them are sickle cell trait. Among other haemoglobinopathies, 0.7% of Bondo population, 3.0% of Didayi population, 3.1% of Juanga population and 3.3% of Kandha population studied had â thalassaemia trait, whereas â thalassaemia major was not encountered amongst the studied tribes. The G6PD deficiency was observed to be present in 0.6%, 1.6%, 7.5% and 4.3% of Bondo, Didayi, Kandha and Juanga population respectively. The PCR assay performed in selected G6PD deficiency cases revealed that all of them are G6PD Orissa mutant.

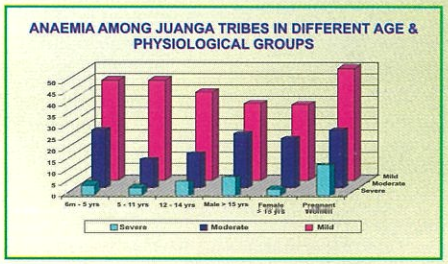


Fig. 1 (d)

Appropriate intervention measures by way of drug supplementation (Tab Fersolate: 60 mg elemental iron / OD) were instituted along with Albendazole (200mg single dose for the children and 400mg for adult). For the community intervention, the IEC activities were undertaken by way of group discussion, interpersonal communication, health awareness and education through posters, pamphlets and audiovisual aids in their respective dialects. A total of 76-discussion sessions was conducted during the study period by the help of selected and trained resource persons from the community.

The follow-up examination and haemoglobin estimation revealed that, there was an improvement of anaemia status in 26.3% of Bondo, 27.2% in Didayi, 24.4% in Juanga and 21.2% in Kandha tribes (Fig 2). The overall repeat stool examination revealed that intestinal parasitic infestation has dropped from 24.6% to 12.4% in Bondo and 24.9% to 13.8% in Didayi, 23.2% to 10.5% in Kandha and 23.9% to 9.8% in Juanga; and the hook worm infestation dropped from 17.9% to 11.7% in Bondo, 13.7% to 9.2% in Didayi, 14.9%to 10.2% in Kandha and 10.3% to 6.6% in Juanga.

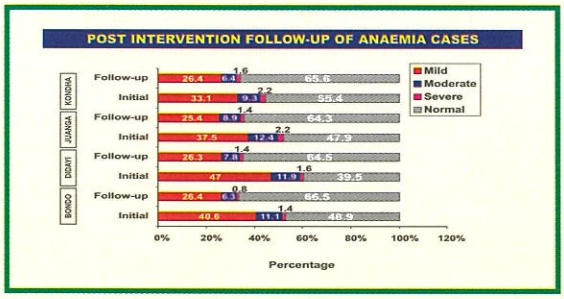


Fig. 2

Table 1. Correlation among the free red cell protoperphyrin with haematological variables (Spearman's Correlation Coefficient)

*p < 0.05; * p < 0.01

CORRELATION AMONG THE FREE RED CELL PROTOPERPHYRIN WITH HAEMATOLOGICAL VARIABLES (Spearman's Correlation Coefficient)

Variables	Hbg/ dl	MCV	MCH	MCHC	FEP
Hbg/ dl	1.000	.526**	.488**	.523**	-.478**
MCV	.473**	1.000	.813**	.769**	-.489**
MCH	.623**	.798**	1.000	.569**	-.453**
MCHC	.561**	.698**	.552**	1.000	-.479**
FEP	-.472**	-.431**	-.463**	-.489**	1.000

Completed Projects

One of the important causes attributed towards the prevalence of high degree of microcytic hypochromic anaemia was the high incidence of helminthic infections largely due to hookworm.

Although the study revealed that there is a high prevalence of malaria (SPR. 15.8% in Bonda, 15.7% in Didayi, 12.9% in Kondha and 14.2% in Juanga) and Pf being 92.3% in Bondo, 92.1% in Didayi, 84.2% in Juanga and 91.2% in Kondha There was no statistical correlation between anaemia and malaria infection.

The FeP estimation was carried out In all the cases and It was observed that there is a negative correlation between the FeP value and other haematological parameters studied (Table 1).

The above data has already been submitted to the Co-Coordinator for central analysis of the multicentric study.

Conclusion:

The study revealed that timely intervention, social awareness, health education and IEC activities have resulted in some improvement by decreasing the worm burden and improving anaemia status in 26.3% of Bondo, 27.2% of Didayi, 24.4% of Juanga and 21.2% of Kandha tribes. This will reduce morbidity and promote good health in the community.

Future strategies:

According to the protocol and MOU the know how is to be transferred to the State Health Authority for conducting NESTROFT and Hb electrophoresis at the P H C level.

1) A few technicians have already been trained.
2) Intermittent deworming treatment with Albendazole may be introduced in the National Parasite Control Programme.
3) IEC activities to be continued in collaboration with National Programmes undertaken in these areas.

3.9 Intervention for hereditary common haemolytic disorders among the major tribals of Sundargarh district of Orissa

Status : Extra-mural (Ministry of Health & Family Welfare, Govt. of India)

Investigators : Dr. R.S. Balgir

Starting date : January 2000

Closing date : December 2004

Objectives:

1. Screening and identification of major vulnerable tribals, namely, Bhuyan and Kharia for hemoglobinopathy, thalassemia and G-6-PD deficiency.
2. Sensitisation, motivation and education through audio-visual aids like posters, charts, pamphlets for carrier detection of above genetic conditions.
3. To provide information for prospective and retrospective genetic/marriage counselling to the affected persons.
4. Imparting of relevant training to the state's local health authorities, like laboratory technician, health workers, etc.
5. Periodic follow up for evaluation, intervention and clinical management of affected cases through local PHC/hospital.
6. To develop a suitable intervention package for prevention and control of hereditary disorders like hemoglobinopathy, thalassemia, G-6-PD deficiency and Rhesus blood group incompatibility.

Background of the study:

Hereditary hemolytic disorders like sickle cell disease, thalassemia syndromes and G-6-PD deficiency are highly prevalent among the tribal populations of India and lead to high degree of anemia, morbidity, mortality and fetal wastage among the vulnerable people. They present increasing challenge to the health care especially to the underprivileged communities. Tribals of Sundargarh district in Orissa, namely Bhuyan and Kharia are highly prone to hemolytic anemia, jaundice, painful crisis, recurrent fever, etc. Since these disorders are hereditary in nature and there is no cure for them, therefore, their prevention is highly essential.

To the best of our knowledge, no intervention programme was undertaken to prevent and control these hereditary disorders in vulnerable tribal communities in Orissa. The undertaken project was designed to fill up this lacuna.

Results:

To achieve the stipulated aims and objectives, sensitisation, motivation and education through pamphlets, holding interactive meetings, discussions, explaining the benefits, purpose and aims and objectives for getting the assured cooperation and help for the implementation of the project was done at district, block and village levels before initiating the study. We adopted biomedical anthropological approach to successfully implement and evolve eco-friendly, tribal-oriented, tribal-friendly, tribal-participatory and, cooperative and health seeking strategy for

this project. The success of this strategy was apparent with overwhelming response of tribal people and their participation and cooperation in every stage for improving the health status and quality of life.

The whole village screening of Bhuyan and Kharia tribes for sickle cell disease, β-thalassemia syndrome and other hemoglobinopathies, and glucose-6-phosphate dehydrogenase (G-6-PD) deficiency revealed the high occurrence of hereditary haemolytic disorders among the major scheduled tribes of Sundargarh district of Orissa.

The sickle cell disorders and hemoglobin E disorders were found in high frequency in Dhelki Kharia (12.4% and 3.2%, respectively), whereas, these were not encountered at all in Dudh Kharia. Haemoglobin E was detected for the first time in Dhelki Kharia tribe from Orissa. The frequency of β-thalassemia trait was higher in Dudh Kharia (8.1%) than in Dhelki Kharia (4.0%) in Sundargarh district of Orissa. The G-6-PD enzyme deficiency was considerably high in Dhelki Kharia (30.7%) in comparison to Dudh Kharia (19.2%). Antimalarials needed to be administered carefully in these tribal populations. The Rhesus (D) blood group negativity was very low (1.1%) in Dudh Kharia tribe and in Dhelki Kharia, it was found absent.

The sickle cell trait was confined only to Paraja Bhuyan (0.9%) and Paik Bhuyan (7.3%). A family with hereditary persistence of fetal hemoglobin (HPFH) in Paraja Bhuyan and hemoglobin D trait in Paik Bhuyan family was detected for the first time in a tribal population in Orissa. The frequency of β-thalassemia trait was the highest in Paraja Bhuyan (12.6%), followed by Paik Bhuyan (7.7%) and Paudi Bhuyan (1.7%) in Sundargarh district of Orissa. The G-6-PD deficiency was recorded to be 21.1%, 16.3% and 13.7% in Paraja, Paik and Paudi Bhuyans, respectively in Sundargarh district of Orissa. The use of antimalarials needs a caution in these tribal people. The frequency of Rhesus (D) negative was very low (0.6%) in Bhuyan tribe of Sundargarh district.

Before starting the awareness in the identified tribal people, the knowledge, attitude and practice (KAP) were studied using a pretested proforma as a measure of pre-intervention as well as post-intervention. The impact of present study of bringing awareness, sensitization and education would initially be expected to be slow, but it would be definite in the subsequent generations due to further enlightenment and experience. As we know that health comes by evolution, not by revolution. Health must meet the needs of the people, as they perceive them. Health cannot be imposed from outside against people's will. It cannot be dispensed to the tribal people.

Imparting of relevant training to State's local health authorities such as PHC doctor, laboratory technician, health workers, Anganwadi teachers, Pharmacists, etc. about the simple tests that can be performed at PHC/CHC level had further enhanced the know how and hand on the art of training in the field of study area. The idea behind this training was to motivate the tribal communities to go for carrier detection and then to refer the positive cases to specialized laboratories for further investigations for confirmation of the diagnosis and treatment accordingly.

Each person who had given blood for investigations was provided with investigation report card. The basic idea of intervention was to bring awareness in these tribal communities about the hereditary/genetic disorders, which are silent/hidden killer diseases. Affected individuals were suitably advised for taking follow up action. Both prospective and retrospective genetic/marriage counseling and interventions were imparted to all disease as well as carrier cases of hemoglobinopathies like sickle cell disease and trait, Hb E disease and trait, Hb D trait, β-thalassemia trait and HPFH and the G-6-PD deficiency through local PHC doctor by holding the interactive discussions taking into consideration the confidence and privacy of each person during the course of this project work. This will help in prevention of hereditary hemolytic disorders in the vulnerable tribal communities and improve their health status and quality of life.

The outcome of the present study has generated database, which is useful for prevention, prenatal diagnosis and control of important public health problem of hemoglobinopathies and G-6-PD deficiency in the region. This eventually will help formulate a strategy for improving the health of the affected people and enable the state government to take up intervention programs and integrate them through the PHCs, district headquarters hospitals and medical college hospitals and the people of the state will, substantially, be benefited. An intervention package was developed which could be replicated at other places.

3.10 Mid-term evaluation of improving nutritional and health status of children in Umerkote block of Nabarangapur district, Orissa

A mid-term evaluation has been carried out to evaluate the efficacy of high-energy biscuits (BP-5), along with the ICDS India-Mix ration. The target population was the severely malnourished children in the age group of 6-36 months, in Umerkote ICDS block of Nabarangpur district.

Status :
Extra-mural (World Food Programme)
Investigators :
Dr. A. Mohapatra, Dr. G. Bulliyya
Starting date : February 2004
Closing date : April 2004

Completed Projects

The study was conducted during February to April 2004. Stratified random sampling procedure was adopted and a total of 400 severely malnourished children were evaluated from

Fig 1. Nutritional status of children by IAP classification

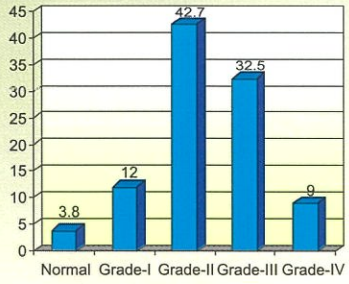
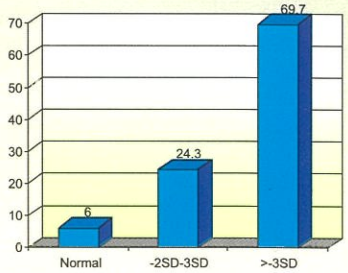


Fig 2. Nutritional status of children (SD-classification)



the list of children selected during baseline. The additional supplement was provided for a period of one year. Growth status (weight-for-age) was evaluated using the IAP cut-off points of Harvard standard and SD classification using NCHS cut-off values.

The results indicate that 3.8% of children were normal, while 12.0%, 42.7%, 32.5%, and 9.0% were grade-I, grade-II, grade-III and grade-IV of malnutrition respectively (Fig. 1). The extent of grade-III and grade-IV malnutrition was more among girls (51.7%) than among boys (30.1%). The proportion of children suffering from underweight was 94%, while 69.7% were severely underweight, as per the SD classification (Fig.2).

The impact of BP-5 biscuits is reflected in terms of improving child growth by using IPA and SD classification in association with quantum of biscuits supplementation. It is suggested to follow the beneficiary children over a period to get the exact impact specifically on each grade of malnourished children separately in terms of improvement, ensuring a systematic cohort follow-up.

Status : EM (Dept. Women & child welfare, Govt. of Orissa)

Investigator : Dr. G. Bulliyya, Mrs. G. Mallick, Mr. R. C. Parida, Dr. S. K. Kar

Starting date : December 2004

Closing date : May 2005

3.11 Assessment of iron deficiency anaemia among adolescent girls in Orissa

Adolescence (10-19 years of age) is a phase of rapid physical growth and development, the nutrients requirement increase and the risk of nutritional deficiencies more pronounced. Anaemia is of particular concern because anaemia during pregnancy is associated with premature births, low birth weight, and perinatal and maternal mortality. It is estimated that iron deficiency anaemia (IDA) is responsible for one fifth of early neonatal deaths and to about 10% of maternal mortality. In India, anaemia affects an estimated 50% of adolescent girls. The National Nutritional Anaemia Control programme initiated in 1970 based on the seriousness of problem to prevent and control nutritional anaemia with IFA tablets.

Since, there is scanty information about anaemia status of adolescent girls in Orissa, and no data available at districts level. The present survey was carried out to assess the prevalence of anaemia in terms of haemoglobin levels among non-school going adolescent girls covering statistically adequate sample. In addition, household socio-economy, demography and nutritional status of adolescent girls were assessed for evaluating the association with anaemia.

A total of 1937 adolescent girls were covered from Khurda (670), Jajpur (647) and Bargarh (620) using 30 cluster PPS sampling. The quality check of haemoglobin levels between external and internal is in good agreement. The mean haemoglobin level was 9.9±1.4 g/dL among adolescent girls. It was 10.1±1.27, 9.8±1.37 and 9.2±1.41 g/dL for adolescent girls of the districts Khurda, Jajpur and Bargarh. The mean levels of haemoglobin (9.9 g/dL) were relatively higher in the districts of Khurda in comparison to Jajpur and Bargarh (Fig-1). The mean haemoglobin levels were below the levels reported by NNMB for the state of Orissa (NNMB, 2003).

Overall, 96.5% of adolescent girls had some degree of anaemia, 45.2% were mildly anaemic, 46.9% were moderately anaemic and 4.4% were severely anaemic according to WHO criteria (Fig-2). About 94%, 96% and 99% of adolescent girls in the districts of Khurda, Jajpur and Bargarh respectively were found anaemic (<12 g/dL). While in the districts of Khurda and Jajpur the anaemia was of milder grade, in Bargarh district, moderate anaemia dominated over mild anaemia. The extent of moderate anaemia and severe anaemia was significantly higher in the district of Bargarh (60.8% and 7.5%) as compared to districts of Khurda (52.2% and 2.5%) and Jajpur (51.5% and 3.4%).

Serum ferritin is an indicator of the relative extent of depletion of iron stores. The mean ferritin concentration was 6.5 ng/mL in Khurda district, which was significantly higher ($p<0.001$) compared to 30.0 ng/mL in Bargarh district. Based on cut-off levels for serum ferritin

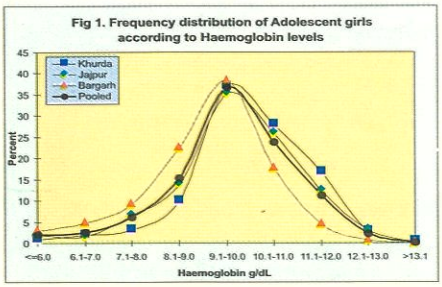
Community awareness campaign on health & nutrition education by RMRC, BBSR

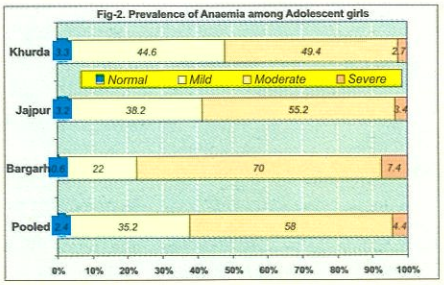
(WHO, 2002), more than forty percent (41.2%) of adolescent girls had ferritin levels below 15 ng/mL reflecting inadequate iron store (**Fig-3**). The proportion of adolescent girls with inadequate iron stores was 28% and 46.7% in the districts of Khurda and Bargarh respectively. The mean concentrations of haemoglobin increased consistently with increase in cut off levels of ferritin. The variation in concentrations of haemoglobin between cut-off values of ferritin was significant.

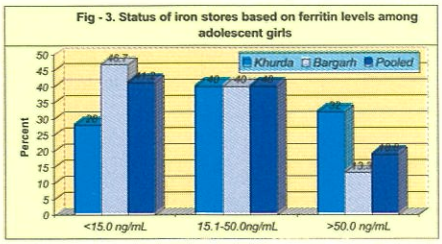
About 38% of adolescent girls were underweight (<Median –2SD of NCHS Weight-for-age), ranged between 31.3% in Khurda and 47.8% in Bargarh districts. The prevalence of stunting and underweight (<5th percentile BMI-for-age) was 32% and 41% respectively. The proportion of underweight girls estimated using weight-for-age and BMI-for-age classifications were the same in the districts of Khurda, Jajpur and Bargarh (Fig 3).

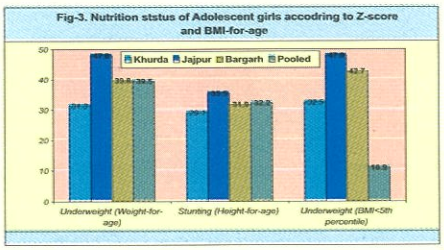
The present study has shown the universal prevalence of anaemia among adolescent girls. Hence, the lack of association seen between the anaemia status and socio-economic factors is in the expected direction. The difference between prevalence of anaemia among the adolescent girls by attainment of menarche, and by the working status and nutritional status as assessed by weight-for-age and BMI-for-age show differences in severe forms of anaemia. Inverse relationship observed between prevalence of moderate and severe forms of anaemia among girls with that of their education status, awareness of anaemia, and consumption levels of pulses, green leaf vegetables, eggs and flesh foods is in expected direction.

The study revealed that non-school going adolescent girls were vulnerable in terms of IDA, food intake and nutritional anthropometry. Their nutritional education was inadequate. In conclusion, the results indicated that there is an urgent need to focus the nutritionally vulnerable group of adolescent girls in the community, which is not included in the national intervention programs. It is therefore, really required to have an intervention program with strengthening the nutrition education component for improving the health and nutritional status of adolescent girls, who are entering shortly in to stressful physiological states of pregnancy and lactation.









3.12 Prevalence of Chlamydia trachomatis infection amongst clinical cases attending OPD–a pilot study

Introduction:

Chlamydia trachomatis infection among females is becoming the major bacterial STD in present days. Infections like syphilis and gonorrhoea has been reduced much because of their expression and relatively easier diagnosis, which enable clinicians to provide satisfactory treatment. Although curative antibiotics are available against the agent, difficulty in diagnosing Chlamydia trachomatis by conventional tests keeps the infection undiagnosed leading to complications like low backache, PID, infertility, recurrent abortions, intrauterine growth

Status :
Intramural

Investigator :
Dr. B. Dwibedi

Collaborators :
Dr. Jayanti Mania, NIRRH, Mumbai
Dr. S. Pattanaik, Department of Obstetrics and Gynecology SCB Medical College, Cuttack

Starting date : January 2005
Closing date : March 2005

Completed Projects

retardation of foetus, still births and neonatal respiratory tract infections. Such untreated infections ultimately leads to maternal health problems leading to complicated pregnancy and endangering child survival. Presently technology and facility for diagnosis of Chlamydia by PCR method is not available in Orissa. So, an attempt has been made to standardize the diagnostic procedure in a hospital based study. Subsequently community prevalence study can be planned and the technology can be transferred to the State medical college laboratories.

Objectives:

To estimate Chlamydia trachomatis infection in females attending out patients department (OPD) of Gynaecology, SCB Medical College and Hospital, Cuttack.

Methodology:

Selection of patients and sample collection:

Women attending the gynecological OPD of SCB Medical College and Hospital, Cuttack with complains of vaginal discharge (mucopurulent), recurrent abortion, pelvic pain or infertility were taken as the study population. The study subjects were selected based on under mentioned criteria:

Inclusion criteria:

1) Women with lower genital tract infection;
2) Women with bad obstetric history (> 2 spontaneous abortion);
3) Infertile women;
4) Women with clinical suspicion of PID or with chronic lower back-ache with vaginal discharge; not having other medical/ orthopedic problems.

Exclusion criteria:

Women treated with antibiotics within one month prior to sample collection.

***Collection of cervical specimen*:**

After patients were enrolled at OPD relevant history was recorded in preformed clinical format. A written consent was obtained from all the patients. The clinical specimen (endocervical swab) was collected under per speculum examination in lying down posture. After removing the excess mucus from the exo-cervix with a sterile cotton ball, the collection swab was rotated in the endo-cervix for 15 to 30 seconds. Then the cervical swabs were kept in separate sterile self-retaining test tubes and transported to the laboratory in icebox and stored in the deep freezer (-140° C).

Diagnosis of Chlamydia trachomatis infection by PCR- Test:

Duplicate coded samples were tested separately at RMRC and NIRRH. DNA extraction was done and Chlamydia infection was identified by PCR using specific primers following the procedure below:

The cervical swabs were dissolved in 1 ml of phosphate buffer saline and the solution was centrifuged after removing the swab stick. DNA was extracted from the cell pellet using DNA extraction solution (DNA Extraction kit, Bangalore Genei) After confirming the presence of DNA (figure 1). DNA segments were amplified by PCR using specific primer (5' GCC GCT TTG AGT TCT GCT TCC 3', 5'GTC GAA AAC AAA GTC ACC ATA GTA 3'} in 40 thermal cycles; each thermal cycle set at 94°C for 1 min- 52°C for 1 min.- 72°C for 2 min. Then the amplified product was run in 2% agarose gel with ethydium bromide and visualised

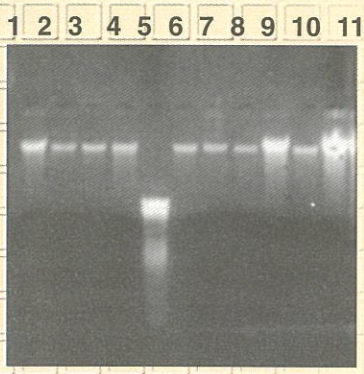


Figure 1.: Genomic DNA on 0.8% agarose gel. Lane1, 2, 3, 4, 6, 7, 8, 9, 10, 11: Genomic DNA. Lane 5: Ladder

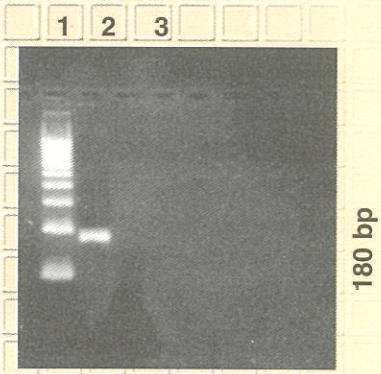


Figure 2: PCR product of 180 bp DNA fragment of *C. trachomatis.* Lane1: 100 bp DNA Ladder, Lane 2: 180 bp PCR product, Lane 3: Negative control

under UV transillumination for identification of 180bp DNA strand (figure 2). Then it was subjected to Southern blot test to observe the chemiluminescence (figure 3).

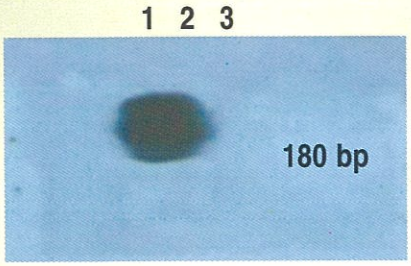


Figure 3: Hybridisation analysis of 180 bp DNA fragment of *C.trachomatis* Lane 1: 100 bp DNA Ladder, Lane 2: 180 bp Hybridisation product, Lane 3: Negative control.

Results:

Patients coming to out patient department of Gynaecology, SCB Medical College, Cuttack were enrolled for study following the criteria of exclusion and inclusion. A total of 108 patients were included in the study and collected specimens subjected to investigation.

The patients were in the age group of 20 to 50years; who presented with single or multiple complains. The observed symptoms were as follows.

Symptoms	Number (n=108)
1. Vaginal discharge	89 (82%)
2. Infertility	21 (19.5%)
3. Recurrent abortion	34 (31.5%)
4. Low backache and PID (suspected)	52 (48%)

All the cervical swabs were subjected to PCR and southern blot technique. Amplification was successful in 71 cases and 7.04% were found positive for presence of C. trachomatis infection. One among them had chronic low backache for longer than 10 years and the other was complaining of infertility. Three had history of recurrent abortion. Eighty percent of them had discharge per vagina.

Conclusion:

Symptomatic females attending Gynaecology OPD of SCB Medical College, Cuttack with clinical suspicion of Chlamydia Trachomatis infection were investigated by PCR test and Southern hybridisation, in a pilot mode. The investigation confirmed presence of Chlamydia trachomatis infection in 2.6% of the patients studied. The study documented genital Chlamydia infection confirmed by DNA identification, for the first time in the state of Orissa. Besides, the molecular diagnosis technique of identifying Chlamydia trachomatis has been transferred to RMRC, and the skill can be transferred to Medical colleges of the state.

3.13 Molecular characterization of *V. cholerae*: Strain typing pattern associated with diarrhoeal outbreaks in Orissa

Status : Intramural

Investigators : Dr. B.B Pal, Dr. G.P. Chhotray, Mr. H.K Khuntia, Dr. A.S. Acharya.

Starting date : November 2003

Closing date : October 2004

Objectives:

1. To isolate different strains of *V.cholerae* and other diarrhoeagenic Vibrios from diarrhoea patients and environmental samples during outbreaks.
2. To identify and type the various isolates of *V.cholerae* for their antibiogram.
3. To detect the various virulence genes like ctxA and tcpA by polymerase chain reaction (PCR) assay.

Completed Projects

4. To study the clonality of the clinical strains with the environmental isolates by RADP PCR, Ribotyping and other methods. And the correlation will be studied, if any, between the mid epidemic and epidemic strains along with the previous isolates.

Methodology:

As per the request of the Directorate of Health Services, Govt. of Orissa outbreaks of diarrhoeal disorders were studied from Keonjhar town and its affected villages (July), Malkanagiri town and its affected villages (August); Chitrada village, Mayurbhanj district (August) and Parbatia village, Dhenkanal district (November) during 2003. Rectal swabs were collected in CBT medium, sub cultured in TCBS, MacA, HEA plates. Significant colonies were tested biochemically following standard techniques for different bacterial enteropathogens and confirmed by specific antiserum.

Results:

The biochemical and serological results revealed that the causative organism for these outbreaks was *V.cholerae* O1 Ogawa biotype El Tor .The detailed results have been depicted in the following table.

Table: Outbreaks of cholera in four districts of Orissa

Area of Outbreak	Name of villages affected	Period	Total rectal swabs	No. +ve for *V.cholerae* (%)	Sero group
Keonjhar town	Tikarguma, Badahal, Raisua, Satsingh, Durgabahal, etc.	July, 2003	36	20 (74.1)	O1
Malkanagiri town	Reglamisin, Katamita, MV8, Latiaguda, Rangamunda, etc.	August, 2003	30	24 (96.0)	O1
Chitrada Mayurbhanj	Chitrada	August, 2003	13	10 (100)	O1
Parbatia, Dhenkanal	Parbatia	November, 2003	6	4 (100)	O1

Antibiogram:

The general antibiogram of the above isolates revealed that the *V.cholerae* were sensitive to tetracycline, ciprofloxacin, norfloxacin and chloramphenic, and resistant to co-trimoxazole, ampicillin, neomycin and nalidixic acid.

Molecular analysis:

The polymerase chain reaction (PCR) assay on representative isolates of *V.cholerae* for the detection of ctxA and tcpA genes revealed that all are positive for ctxA and tcpA genes showing biotype El Tor. Similarly some selected strains of *V.cholerae* were subjected to randomly amplified polymorphic DNA (RAPD) analysis with 1281 primer exhibited similar RAPD pattern like Kolkata stains.

4. INFORMATION & PUBLICATION

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4.12 Animal Ethical Committee:

4.13 Technical Equipment Purchase Committee:

4.14 Technical Building Maintenance Committee:

4.15 Staff position

Information & Publication

4.1 Publications

Publications in journals during calendar year 2004

1. Babu BV and Kar SK. Coverage, compliance and some operational issues of mass drug administration during the programme to eliminate lymphatic filariasis in Orissa, India. *Tropical Medicine and International Health,* 9 (6): 701-709 (2004).
2. Babu BV and Nath N. The programme to eliminate lymphatic filariasis in Orissa, India: the attitudes of some programme partners. *Annals of Tropical Medicine and Parasitology,* 98 (7): 751-7 (2004).
3. Babu BV and Nayak AN. Recording and reporting process of health information by the health system: a study from Khurda district of Orissa, India. *Journal of Human Ecology*, 15: 295-297 (2004).
4. Babu BV, Hazra RK, Chhotray GP and Satyanarayan K. Knowledge and beliefs about elephantiasis and hydrocele of lymphatic filariasis and some socio-demographic determinants in an endemic community of eastern India. *Public Health*, 118: 121-127 (2004).
5. Balgir RS, Dash BP and Murmu B. Blood groups, hemoglobinopathy and G-6-PD deficiency investigations among fifteen major scheduled tribes of Orissa, India. *The Anthropologist*, 6 (1) : 69-75 (2004).
6. Balgir RS. Health care strategies, genetic load and prevention of hemoglobinopathies in tribal communities of India. *South Asian Anthropologist,* 4 (2): 189-198 (2004).
7. Balgir RS. Hereditary persistence of foetal haemoglobin in a tribal family of Orissa, India. *National Medical Journal of India,* 17 (3): 138-40 (2004).
8. Bulliyya G. Anthropo-ecological dimensions of the Eastern ghats section of Orissa: an overview. *South Asian Anthropologist,* 4 (1): 73-88 (2004).
9. Bulliyya G. Micronutrient malnutrition with reference to iron deficiency anaemia status in Orissa. *Man in India,* 84 (1): 33-50 (2004).
10. Chhotray GP, Dash BP and Ranjit MR. Spectrum of haemolglobinopathies in Orissa, India. *Haemoglobin,* 28: 117 – 122 (2004).
11. Mangala A, Khare A, Vineeth V, Pandey NN, Mukhopadhyay A, Ravindran B, Bal V, George A and Rath S. Pleiotropic consequences of Bruton tyrosine kinase deficiency in myeloid lineages lead to poor inflammatory responses. *Blood*, 104 (4): 1191-1197 (2004).
12. Noordin R, Aziz RA and Ravindran B. Homologs of the Brugia malayi diagnostic antigen BmR1 are present in other filarial parasites but induce different humoral immune responses. *Filaria Journal*, 31; 3(1): 10 (2004).
13. Panda M and Mohapatra A. Malaria control: An overview in India. *Journal of Human Ecology*, 15 (2): 101-104 (2004).
14. Ranjit MR, Das A, Chhotray GP, Dash BP and Das BN. The Pfcrt (K76T) point mutation favours clone multiplicity in P.falciparum infection. *Tropical Medicine and International Health*, 9 (8): 857-861 (2004).
15. Ranjit MR, Das A, Chhotray GP, Roth RN and Kar SK. The pfCRT (K76T) point mutation in plasmodium falciparum and its usefulness for monitoring chloroquine resistance. *Annals of Tropical Medicine and Parasitology*, 98 (8): 879-882 (2004).
16. Vathsala PG, Pramanik A, Dhanasekharan S, Ushadevi C, Pillai CR, Subbarao SK, Ghosh SK, Tiwari SN, Sathyanarayan TS, Deshpande PR, Mishra GC, Ranjit MR, Dash AP, Rangarajan PN and Padmanavan G. Widespread occurrence of the Plasmodium falciparum chloroquine resistance transporter (PfCRT) gene haplotype SVMNT in P.falciparum malaria in India. *American Journal of Tropical Medicine and Hygiene,* 70 (3): 256 – 259 (2004).

Publications in journals during calendar year 2005 (Upto March 2005)

1. Babu BV, Nayak AN and Dhal K. Epidemiology of episodic adenolymphangitis: a longitudinal prospective surveillance among a rural community endemic for bancroftian filariasis in coastal Orissa, India. *BMC Public Health*, 5: 50 (2005).

2. Babu BV. A rapid method to assess the coverage of the mass drug administration of diethylcarbamazine in the programme to eliminate lymphatic filariasis. *Southeast Asian Journal of Tropical Medicine and Public Health*, 36: 44-45 (2005).
3. Balgir RS. Detection of rare blood group "Bombay (oh) phenotype" among the Kutia Kandh primitive tribes of Orissa, India. *International Journal of Human Genetics*, 5 (3): 193-198 (2005).
4. Bulliyya G. Growth status of children under-six in a tribal dominated ICDS block of Kalahandi district of western Orissa, India. *South Asian Anthropologist,* 51 (1): 61-76 (2005).
5. Das D, Kumar S, Dash AP and Babu BV. Knowledge of lymphatic filariasis among the population of an endemic area in rural Madhya Pradesh. *Annals of Tropical Medicine and Parasitology,* 99: 101-104 (2005).
6. Kerketta AS, Babu BV, Rath K, Jangid PK, Nayak AN and Kar SK. A Randomised clinical trial to compare the efficacy of three treatment regimens along with foot care in morbidity management of filarial lymphoedema. *Tropical Medicine and International Health,* 10: 698-750 (2005).
7. Rath K, Swain BK, Mishra S, Patasahani T, Kerketta AS and Babu BV. Peripheral health workers' knowledge and practices related to filarial lymphoedema care: a study in an endemic district of Orissa, India. *American Journal of Tropical Medicine and Hygiene, 72*: 430-433 (2005).

Publications in Press:

1. Babu BV, Nayak AN, Rath K and Kerketta AS - Use of Dermatology Life Quality Index in filarial lymphoedema patients. *Transactions of Royal Society of Tropical Medicine and Hygiene* (in press).
2. Babu BV, Rath K, Kerketta AS, Swain BK, Mishra S and Kar SK - Adverse reactions following mass drug administration during the programme to eliminate lymphatic filariasis in Orissa state of India, *Transactions of Royal Society of Tropical Medicine and Hygiene* (in press).
3. Sahoo PK, Satapathy AK, Michael E and Ravindran B. Concomitant parasitism: Bancroftian filariasis and intenstinal helminths and response to albendazole. *American Journal of Tropical Medicine & Hygiene* (in Press).
4. Balgir RS. The spectrum of hemoglobin variant in two scheduled tribes of Sundergarh District in North- Western Orissa, India. *Annals of Human Biology*- 2005 (In press).

Publications in edited books/Monograph:

1. Babu BV. Social and behavioural issues of mass drug administration and morbidity management in the progrmme to eliminate lymphatic filariasis. In: Scientific Working Group Report on *Lymphatic Filariasis.* WHO/TDR, World Health Organisation, Geneva, Switzerland. (in press).
2. Bulliyya G. Micronutrient malnutrition with particular reference to the state of Orissa. In: G.S. Toteja & Padam Singh (eds.), *Proceedings of Workshop on Research Methodologies for Micronutrient Research iron deficiency anaemia status in Orissa.* New Delhi. pp. 37-47.
3. Bulliyya G. Environment and health status of primitive Paudi Bhuiyan tribe in northeastern part of Orissa. In: P. Dash Sharma (Edition), *Anthropology of Primitive Tribes of India.*2005; (in press).
4. Balgir RS. Prevention of common hereditary disorders in India: Sickle cell diseases, Beta-Thalasemia and G6 PD deficiency. RMRC (ICMR), Bhubaneswar pp. 1-12 (Monograph)

4.2 Human Resource Development

Ph.D. awarded

1. Dr. Abhaya Narayan Nayak was awarded Ph.D. in Anthropology by the Sambalpur University under the guidance of Dr. B.V. Babu. The title of his thesis is "Lymphatic filariasis in rural coastal Orissa: an analysis of bio-cultural dimension of the disease and its treatment".

Information & Publication

Ph.Ds. enrolled

Sl. No.	Name	University	Title of the Ph .D Topic	Guide/Co-guide
1	Mr. Alok Das Mohapatra	Utkal	A study of apoptosis in filariasis	Dr. B.Ravindran
2	Mr. Sudhansu Sekhar Nisank	Utkal	Molecular characterization of thalasemia and its clinical significance in Orissa	Dr.G.P.Chhotray
3	Mr. H.K.Khuntia	Utkal	Molecular epidemiological analysis of *Vibrio cholerae* associated with epidemic and endemic cholera in coastal and tribal districts of Orissa	Dr. G.P.Chhotray
4	Mr. N.S. Marai	Utkal	Current trends in malaria transmission in Orissa, India	Dr. A.P.Dash
5	Mr. N.N. Mandal	Utkal	Studies on the immuno-protective potential of detergent soluble and llpld antigen of filarial parasite in lymphatic filariasis	Dr. M.K.Das
6	Mr. Aditya K Panda	Utkal	Genetic Polymorphism in Malaria and Filaria.	Dr. B. Ravindran
7	Dr. S. S. Padhi	Utkal	Immuno Epidemiological correlation between Malaria & Filariasis	Dr. B. Ravindran
8	Mr. Santosh K Panda	Utkal	Innate and adoptive immunity in experimental and Human Filariasis	Dr. B. Ravindran
9	Mr. B. R. Sahu	Utkal	Role of antibodies in protective immunity in human and experimental filariasis	Dr. B. Ravindran
10	Mr. Mahendra Panda	Utkal	Problem of Endemic Malaria among tribal and Non- tribal; population in KBK region of Orissa	Dr. A.Mohapatra
11	Ms. Anamika Das	Kalyani	Clinical malaria: association of CD36 gene polymorphism and *P.falciparum* genotypes	Dr. M.R.Ranjit

M. Sc. Dissertation Work:

The following students from various universities/institutes have done their M.Sc. dissertation works in RMRC laboratories under the guidance of scientists.

Student	Institution	Dissertation Topic	Guide
Ms. Arpita Ghosh	Utkal University	IgG antibody response to excretory secretory antigens of female adult *Setaria digitata* in filariae endemic individuals: An immunological marker for exposure to filariasis	Dr. M.K.Das
Mr. Ravi kumar	Utkal University	Characterization of excretory secretory antigens of microfilariae and their use as Immunodlagnostic agents in detection of individuals infected with *Wuchereria bancrofti*'	Dr. M.K.Das
Ms. Pujashree Das	Merit Institute of Technolo-gy, Ooty	Sight into Bancroftian filariasis	Dr. M.K.Das
Ms. Rasmita Mahapatra	Ravenshaw College, Cuttack	Assessment vectorial capacity of Anopheline vectors using PCR after a control measure	Dr.N.Mahapatra
Ms. Shakti Prava Mishra	Berhampur University	Hemoglobinopathies and G-6-PD deficiency in malaria patients of Southern Orissa	Dr.R.S.Balgir
Mr. Jayant Mahapatra	Berhampur University	Beta-Thalassemia and G-6-PD deficiency in Blood Donors at Blood Bank, M.K.C.G. Medical College & Hospital	Dr.R.S.Balgir
Ms. Amrita Kumari Panda	Utkal University	Hemoglobinopathies in pregnant women in a hospital southern Orissa.	Dr.R.S.Balgir
Ms. Mamata Ray	Utkal University	Sickle cell hemoglobinopathy in pregnant women in an urban hospital	Dr.R.S.Balgir
Rashmita Kumari Padhy	Utkal University	Hemoglobinopathies in children in a hospital of southern Orissa.	Dr.R.S.Balgir
Mr Santosh Kumar Sethi	Utkal University	Sickle cell hemoglobinopathy in a rural PHC of Ganjam district, Orissa.	Dr.R.S.Balgir

Information & Publication

Student	Institution	Dissertation Topic	Guide
Kumari Vishi	North Orissa Univ.	Combined detection of wucheria bancrofti and brugia malayi by singlr PCR	Dr. R.K.Hazra
Ajit Kumar Mohanty	MITS	Prevalence of wolbachia DNA from mosquito (ades) using tetracycline treatment.	Dr. N. Mohapatra
Ranjan Kumar Pati	MITS	Prevalence of wolbachia DNA from mosquito (culex) using tetracycline treatment.	Dr.N. Mohapatra
Pulak Ranjan Nayak	North Orissa Univ.	Isolation , identification and antibiogram of E. Coli from hospitalized diarrhoea patients.	Dr. B. B. Pal
Soumya S. Das	North Orissa Univ.	Prevalence of Vibrio cholerae among hospitalized diarrhoea patients of some selected areas of Orissa	Dr. BB Pal
Sujata Sahoo	North Orissa Univ.	Shigellosis among acute diarrhoea patients: A hospitalized study.	Dr. BB Pal
Ipsita Mishra	Ravensaw College	Detection of ETEC among E. Coli isolates obtained from acute diarrhoeal patients in hospitals patients in hospitals of Bhubaneswar and Puri.	Dr. M.R.Ranjit
Sasmita Sutar	OUAT	The PfCRT gene polymorphisms	Dr.M.R.Ranjit
Nirupama Biswal	Ravensaw College	Detection of EggEC in hospitalized diarroheal cases of Bhubaneswar and Puri	Dr. M.R.Ranjit

RMRC Foundation Day Celebration

4.3 Symposia/workshops/training organized by RMRC

1. Two Laboratory Technicians from Bharat Vikash Parisad and TASWELS have undergone training on **"Detection of beta-thalassemia and laboratory diagnosis of sickle cell disorders"** in Human Genetics division during April and August 2004.
2. Celebrated Observation of **World Health Day** at Jaydev Bhawan, Bhubaneswar, Orissa jointly organized by SIHFW, RMRC, ROHFW during 7th-9th April 2004.
3. Workshop cum training on **Verbal Autopsy** was organized by Regional Medical Research Centre, Bhubaneswar for SRS supervisors on verbal autopsy methodology at RMRC, Bhubaneswar during 1st – 3rd June 2004.
4. State level symposium on **"Emerging & Re-emerging Infectious Diseases"** was organisedd on 7th June 2004 in RMRC, Bhubaneswar. The symposium was inaugurated by Honorable Minister of Health & Family Welfare, Govt. of Orissa, Sri Bijayshree Routray.
5. **Training on Verbal Autopsy**: Regional Medical research Centre, Bhubaneswar organized refresher training for SRS supervisors on verbal autopsy methodology at RMRC, Bhubaneswar during 7th – 9th June 2004 and on 15th June 2005.

6. The Centre organized a training on **"Assignment of cause of death and ICD-10 code"** for the physicians of SPM Dept, SCB Medical college Cuttack during 24th-25th June 2005.
7. **"Symposium on Prevention & Control of Malaria & Challenges for Population Stabilization"**, was jointly organized by Confederation of Indian Industry (CII) & Infromation International (INFOIN), Bhubaneswar in collaboration with RMRC, EMCP, State Institute of Health & Family Welfare at Hotel Meghdoot on 15th July 2004.
8. A workshop–cum-training program **(JCCC@ICMR)** for eastern and southern region ICMR institutions librarian was organized by RMRC Bhubaneswar on 4th August 2004.
9. Regional Medical Research Centre, Bhubaneswar organized an International workshop sponsored by ICMR - Ellison Medical foundation on **"Methodologies in Medical Research"** during 16th –20th August 2004 at Bhubaneswar.
7. Extramural training programmes of mid-level managers under Immunization Strengthening Project (RCH) was organised in collaboration with NICED, Kolkata at Prasar Bharati Bhawan, Bhubaneswar, during 22nd- 27th November 2004.
8. Training for Professional Development Course (PDC) in Public Health Management and Health Sector Reforms for district level medical officers for the state of Orissa, Chhatishgarh and Jharkhand was organized by State Institute of Health & Family Welfare in collaboration with RMRC, and series of lecturers were organized at RMRC on 18th January 2005.
9. Epidemic preparedness Training (Malaria) for ADMO/DMO was organized by EMCP, Orissa in collaboration with RMRC at RMRC, Bhubaneswar during 17th-19th February, 2005
10. Workshop on clinical management of severe and complicated *P. falciparum* malaria was organized at RMRC in collaboration with MRC, Delhi during 21st –23rd March 2005.

4.4 Scientific lectures and events organised

1. Dr. Sabina Mand of Bernhard Nocht Institute of Tropical Medicine, Hamburg, Germany delivered a lecture on "Use of Ultrasound in Filariasis" on 14th June 2004.
2. Dr. Syamal Roy, Indian Institute of Chemical Biology, Kolkata delivered a lecture on " Antigen presentation in Leishmania donovani infection" on 21st June 2004.
3. **National Technology Day:** The National Technology day was observed by the Centre on 13th May 2005. Dr. N. Sarangi, Director, Central Institute of Fresh Water and Aquaculture (ICAR), Bhubaneswar delivered a talk on "Technology on Aquaculture-Present, Past and Future".
4. **National Science Day:** National Science Day was observed on 28th February 2005 at RMRC Bhubaneswar. Prof. Trilochan Pradhan, eminent physicist and former Director of Institute of Physics and former Vice-chancellor, Utkal University delivered a lecture "Celebration of Physics".
5. **RMRC Foundation Day** : 24th RMRC Foundation Day was celebrated on 29th March 2005. Dr. Manoroma Mohapatra, Editor of Oriya Daily "The samaja" inaugurated the ceremony and Dr. Debakanta Mishra, eminent physicist delivered a speech on Einstein's Theory of Relativity since the year 2005 is being observed as International year of Physics. The evening session was dedicated for the children of the staff of RMRC. The dance, song and drawing competitions were held among the children and colourful cultural program was organized in the campus.
6. **Vigilance Awareness week :** RMRC, Bhubaneswar observed vigilance awareness week during 1-6 November 2004 in its premises. A seminar participated by all officers and staff was held on 1st November 2004 at 11.00 A.M. and harmful effects of corruption was highlighted in the seminar. All the officials in the seminar also took the pledge as directed by Central Vigilance Commission.

4.5 Foreign visits

1. Dr. S.K.Kar Co-investigator of Indo-German collaboration study entitled " Post DEC reaction in human bancroptian filariasis" visited Bonn, Germany from 14th - 20th Dec 2004.
2. Dr. M.R. Ranjit has undergone an advanced research training on molecular genomics of malaria parasite from 18th October 2004 to 14th January 2005 as short term DBT overseas associate in Drexel University College of Medicine, Philadelphia, USA.

ICMR Foundation Day Celebration in RMRC, BBSR

Information & Publication

4.6 Awards

1. Dr. G.P. Chhotray, has been awarded "Sir Shriram Memorial Award for 2003-2004" by National Academy of Medical Sciences (India), New Delhi.
2. Dr. B. Ravindran has been awarded "Dr. Pran Nath Chhuttani Oration Award" National Academy of Medical Sciences (India), New Delhi.
3. Mr. R.N. Nayak under WHO In-Country Fellowship Program participated in "Field Epidemiology Training Programme for Paramedicals (FETP)" organized by National Institute of Communicable Diseases, New Delhi.

4.7 Meetings/seminars /symposia/workshops attended by RMRC scientists

1. Dr. B. Ravindran attended the annual RAP-SAC as a member of Research Are Panel (NII, New Delhi; 8-10th April 2004).
2. Dr. S. K. Kar attended one day dissemination workshop on training progress towards sustaining elimination of iodine deficiency disorder in Orissa held at State Institute of Health and Family Welfare, Bhubaneswar on 15th April 2004.
3. Dr. B.V. Babu participated in Workshop on drug delivery strategies for lymphatic filariasis in urban areas in India (NICD, New Delhi; 20-23 April 2004), organised by UNICEF/UNDP/ World Bank/WHO Special Programme for Research and Training in Tropical Disease (WHO/TDR).
4. Dr. S. K. Kar attended Task Force Meeting on Malaria at New Delhi ; 18th May 2004 as a member.
5. Dr. B. Ravindran attended the Fellowship Committee of ECD Division, ICMR as a member (ICMR, New Delhi; 25th May 2004).
6. Dr. S. K. Kar attended Malaria meeting as expert member of the Committee (Regional Directorate of Health and Family Welfare, Bhubaneswar; 11th June 2004).
7. Dr. B. Ravindran attended the Project Advisory Committee of ICMR on Malaria, Filariasis and Leishmaniasis (ICMR headquarters, New Delhi; 25th June 2004).
8. Dr. S.K. Kar and Dr. B.V. Babu attended as resource person in Training to Additional district Medical Officers on Filariasis Control Programme (Bhubaneswar; 25-26th and 28-29th June 2004), organised by Regional Directorate of Health & Family Welfare, Govt. of India.
9. Dr. S. K. Kar attended Workshop on Orissa Health Sector Plan (OHSP) for presentation of the draft action plan for Orissa Health Sector based on "Orissa Vision 2010 – A Health Strategy (Bhubaneswar; 2nd July 2004), organized by Policy & Strategic Planning Unit, Health and Family Welfare, Orissa.
10. Dr. S. K. Kar delivered a keynote address as chief speaker in the state level symposium on "Prevention & Control of Malaria in the Industrial Belt of Orissa – Emerging Needs and Challenges for Population Stabilization" on the eve of World Population Day at Hotel Swasti, Bhubaneswar; 11th July 2004.
11. Dr. S. K. Kar ttended the Meeting and delivered a talk on "Emerging diseases and population growth" on the occasion on the occasion of World Population Day (Bhubaneswar; 11th July 2004), organized by Population Research Centre, Bhubaneswar.
12. Dr. N. Mahapatra attended training on use of geographical information system and remote sensing technology on mapping of vector habitats (VCRC, Pondicherry; 14-16th July 2004).
13. Dr. S. K. Kar participated in the meeting on the occasion of "Census Data Dissemination Day"(Jaydev Bhawan, Bhubaneswar; 14th July 2004). His Excellency, Sj. M.M. Rajendran, Hon'ble Governor of Orissa presided over the meeting.
14. Dr. S. K. Kar attended as chief speaker and delivered a keynote address on "Prevention of malaria - Current Challenges" in the inaugural function in the state level symposium on Prevention & Control of Malaria in industrial belts of Orissa & Challenges for Population Stabilization (Hotel Meghdoot, Bhubaneswar; 15th July 2004).
15. Dr. S. K. Kar attended NNMB Steering Committee Meeting (Hyderabad; 23rd July 2004).
16. Dr. G. Bulliyya attended a meeting on 'Improving Nutritional and Health Status of Children in Umerkote, Orissa" (Hotel Swasti Plaza, Bhubaneswar; 23rd July 2004).
17. Dr. S. K. Kar attended the inaugural function of Regional Museum of National History (Bhubaneswar; 10th August 2004).
18. Dr. S. K. Kar, Dr. A. S. Kerketta, Dr. B. Dwibedi and Dr. A.S. Acharya attended ICMR-Ellison Foundation Workshop on Methodologies in Medical Research & Epidemiology (Hotel Crown, Bhubaneswar; 16-20th August 2004).

Poster presentation by research scholar during SAC meeting

19. Dr. S. K. Kar attended 2nd Steering Committee Meeting on MDA (Bhubaneswar; 17th August 2004), organized by DHS, Orissa.
20. Dr. S. K. Kar participated in the Brain Storming Session for Development of Biotechnology Sector in Orissa (State Secretariat, Orissa; 19th August 2004).
21. Dr. S. K. Kar attended expert group meeting (ICMR headquarters, New Delhi; 24th August 2004).
22. Dr. S.K. Kar attended immunization programme (RMRC, Bhubaneswar; 30th August – 4th September), organized by NICED, Kolkata.
23. Dr. S. K. Kar delivered a talk on "Application of Physics in Medical Science" at Institute of Physics, as Guest of Honour" on the occasion of Foundation Day of Institute of Physics (Bhubaneswar; 4th September 2004).
24. Dr. S. K. Kar acted as Resource Person and delivered a talk on "Filariasis-Current Perspective" in the Workshop of joint directors & CDMOs on MDA (Hotel Pushpak, Bhubaneswar; 7th September 2004).
25. Dr. S. K. Kar attended a meeting on Board of Studies on Biotechnology (Utkal University, Bhubaneswar; 13th September 2004).
26. Dr. S. K. Kar delivered keynote address on "Thallasemia - Current prospective" on National Thalassaemia Day celebration by Taswels Orissa (OAS officers building, Bhubaneswar; 14th September 2004).
27. Dr. B. Ravindran attended Pre-SAC meeting of Malaria Research Centre, New Delhi as a member (MRC, New Delhi; 9th September 2004).
28. Dr. B. Ravindran attended as member the Project Advisory Committee on Health Sciences of Department of Science and Technology, Govt. of India (RP Centre of Ophthalmic Sciences, New Delhi; 7– 8th October 2004).
29. Dr. S. K. Kar attended International Symposium of Emerging Viral Infection: New Frontiers and Challenges on the occasion of Golden Jubilee Event of National Institute of Virology (NIV, Pune; 11-13 October 2004).
30. Dr. S. K. Kar participated in 24th Annual APICON, Orissa Branch (MKCG Medical College, Berhampur; 13 –14th November 2004).
31. Dr. R.K Hazra participated and presented a scientific paper in Joint Annual conference of Indian Society for Malaria and Other Communicable. Diseases and the Indian Association of Epidemiologist (New Delhi; 19-21st November 2004).
32. Dr. G.P.Chhotray attended the XXVIII National Congress of Indian Association of Medical Microbiologists and presented a paper on "Health status of Primitive tribes of Orissa with special reference to diarrhoeal disorder including cholera" (Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow; 25-28 November 2004).
33. Dr. S. K. Kar delivered a guest lecture on "Future perspective of Physiology" as Chief speaker on 19th Annual Conference of Association of Physiologists of Orissa (Hotel Akbari, Bhubaneswar; 27th November 2004).
34. Dr. G. Bulliyya participated in State level seminar on "GO and NGO Partnership" (Orissa Voluntary Health Association, Bhubaneswar; 6th December 2004).
35. Dr. B. Ravindran attended as member the Project Advisory Committee on Health Sciences of Department of Science and Technology, Govt. of India (Shankara Nethralaya, Chennai; 7-8 the December 2004).
36. Dr. S. K. Kar delivered guest lecture on "Life style disease" at National Seminar on "Contemporary Life Styles and management of Mental Health" (Puri; 10th December 2004), organized by Indian Society of Psychiatrists.
37. Dr. S. K. Kar as Chief speaker delivered a talk on "Health Technology as fulcrum of development for the nation" (RMRC, Bhubaneswar; 11th December 2004), organised by Indian Science Congress Association, Orissa Chapter.
38. Dr. R. S. Balgir participated and presented a paper entitled "Medical Genetics in Orissa: An Urgency in Health and Disease" in the 8th Orissa Bigyan Congress (Bhubaneswar; 11-12th December 2004).
39. Dr. R. S. Balgir was invited to deliver a Lead Lecture entitled "Dimensions of Rural Tribal Health, Nutritional Status of Kondh Tribe and Tribal Welfare in Orissa: A Biotechnological Approach" in UGC Sponsored National Conference on Human Health and Nutrition: A Biotechnological Approach (Thane; 12-13th December 2004).
40. Dr. A.K.Satapathy and Dr. M.K. Beuria attended 31st Annual conference of Indian Immunology Society and presented a paper on "Bancroftian filariasis: soluble

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circulating factors induce inhibition of T cell proliferation" and "Antigen assay at 10 years after DEC treatment indicates marginal conversion to infection-free state in Wuchereria bancrofti endemic regions of Orissa, India", respectively (Anna University, Chennai; 15-18th December 2004).

41. Dr. B. Ravindran attended the annual meeting of the Indian Immunology Society as an invited speaker (Anna University, Chennai; 17 –19th December 2004).
42. Dr. S. K. Kar delivered a talk on "Clinical history of filariasis" (University of Bonn, Germany; 20th December 2004).
43. Dr. A. S. Kerketta, attended Workshop on web based assignment of cause of death at Delhi from 22nd-24th Dec 2004.
44. Dr. B. Ravindran attended as a member of the Scientific Advisory Committee of the 'Centre for Research in Medical Entomology' (Madurai; 26 –27th December 2004).
45. Dr. A. S. Acharya participated In "International Conference on Future of Statistical Theory, Practice and Education" and presented paper on "Sequential estimation of genetic parameters for multiple alleles at locus: an empirical application to sickle cell disorder" (Hyderabad; 29th December 2004 - 1st January 2005).
46. Dr. S. K. Kar participated in a programme "Science Magazine" and discussed in local language on "Problems on filariasis and malaria" (broadcasted on 13th January 2005), organized by Doordarshan, Bhubaneswar.
47. Dr. G. Bulliyya presented a paper on 'Nutritional deficiency disorders in the state of Orissa' in Professional Development Course in Public Health and Health Sector reforms' for the District level Medical Officers (RMRC seminar-hall, Bhubaneswar; 18th January 2005).
48. Dr R.K Hazra attended a symposium on molecular medicine and participated in discussion (Cuttack; 23rd January 2005), organized by Department of Biochemistry, S.C.B. Medical College Cuttack.
49. Dr. B. Ravindran attended the annual meeting of the Molecular Immunology Forum, as a Co-convener (National Institute of Oceanography, Goa; 2-5 February 2005).
50. Dr. S. K. Kar delivered key note address on "Health Technology & Social development" at Regional Conference on Popularization of Science & Technology for Social Development, (Institute of Physics, Bhubaneswar; 3rd February 2005), organized by Kalinga Foundation Trust.
51. Dr. B. Ravindran attended as an invited speaker a joint meeting of Indian and German Immunology Societies at New Delhi and presented a paper "Does host immunity function inside filarial worms?" (New Delhi; 6-7th February 2005).
52. Dr. A. S. Acharya participated in National E- governance meeting (Hotel Swosti Plaza, Bhubaneswar; 6-8th February 2005).
53. Dr. R. S. Balgir was invited to participate and present a paper entitled "Medical Biotechnology in Human Health and Disease: A Commitment Towards the Service of Society" in the workshop on 'Biotechnology-Potentials in Orissa' (Bhubaneswar; 11-13th February 2005).
54. Dr. S. K. Kar participated in Epidemic Preparedness Training (Malaria) of ADMOs / DMOs and delivered a talk on "Field situation and importance of operational studies" (RMRC, Bhubaneswar; 17-19th February 2005).
55. Dr. S. K. Kar attended Governing Body meeting of Association of Physicians (Orissa State Branch) (S.C.B. Medical College, Cuttack; 20th February 2005).
56. Dr. R. S. Balgir participated as Treasurer in the Governing Council Meeting and the General Body Meeting of the Indian Society of Human Genetics (Hyderabad; 20-21st February 2005).
57. Dr. R. S. Balgir participated and presented a paper entitled "Molecular spectrum of hemoglobinopathies in Orissa: A Major Thrust Area of Research" in 9th ADNAT and 30th Annual conference of the Indian Society of Human Genetics (Hyderabad; 20-23rd February 2005).
58. Dr. S. K. Kar attended National Seminar on Homeopathy and delivered a talk as Guest Speaker on "Impact of Environmental Pollution and industrial hazards on ARI" (Rabindra Mandap, Bhubaneswar; 23rd February 2005).
59. Dr. S. K. Kar attended Sixth Sir Dorabji Tata Symposium on Viral Hepatitis (J.N.Tata Auditorium, Indian Institute of Science Campus, Bangalore; 10-11th March 2005).

60. Dr. B. V. Babu attended a meeting on development of drug delivery strategies for lymphatic filariasis elimination in urban areas in India (Tuberculosis Research Centre, Chennai; 18th March 2005).
61. Dr. M.R Ranjit attended the symposium as a resource person for the workshop on "Clinical management of severe and complicated P. falciparum malaria" and delivered lecture on "Diagnosis of Malaria" (RMRC, Bhubaneswar; 21-23rd March 2005).
62. Dr. R.K. Hazra attended as a resource person in the workshop on clinical management of severe and complicated P falciparum on malaria (RMRC, Bhubaneswar; 21-23rd March 2005), organised by MRC, New Delhi.
63. Dr. B.V. Babu attended National Seminar on Emerging issues in Gender Studies and presented a paper entitled, "Women's health in India: an emphasis on health consequences of domestic violence". (Sambalpur University, Sambalpur; 30-31st March 2005).

4.8 Facility

Library & Information:

Library & Information Centre of Regional Medical Research Centre, Bhubaneswar houses an exclusive collection of books, foreign and Indian journals, databases, reprints, etc. on various subjects of biomedical sciences. For the calendar year 2005, the library subscribed 25 foreign journals and 38 Indian journals and procured 125 books. The library provides services like reference, inter-library loan, on-line literature/database search through Internet and off-line MEDLINE services. The reprint request is also provided to the scientists through ICMR Librarians Group Mail services (icmrlibrarians@yahoo.com) and through JCCC@ICMR. The Local Area Networking (LAN) has installed and 48 nodes have been allocated for Internet connection through ISDN connection.

The library & Information division is doing publication activities of the center. RMRC News Bulletin entered 5th year of its publication and carries research articles contributed by its own scientists and researchers on various field of their working areas. In addition, the library is publishing a biannual library News Letter. IEC materials are also made on various diseases on local languages for distribution to the public. Besides, the division looks after the publication of Centre's Annual Report.

Activities of NNMB Unit, Orissa, Bhubaneswar

The NNMB Unit, Orissa under NIN, Hyderabad functioning at RMRC, Bhubaneswar has completed the survey for assessment of Diet and Nutritional status of community and prevalence of Hypertension and Anaemia in rural adult males and NPNL women in eighty (80) villages of sixteen (16) districts of Orissa by May 2005. The data was regularly sent to NIN, Hyderabad for analysis.

The survey included assessment of demography and socio-economic status of families, Nutritional status (clinical, anthropometry and morbidity assessment), Diet & Nutritient intake using individual dietary food intake method, Haemoglobin estimation in adult males and NPNL females i.e. e"20 years of age by cyanomethaemoglobin method, estimation of blood pressure among adult males and NPNL females, measurement of waist circumference and Hip circumference of adult males & NPNL females and administration of KAP schedules of Hypertension and Diabetes mellitus among adult males and NPNL females.

The general objective of this survey is to assess the diet and nutritional status of the rural community and prevalence of obesity and hypertension among adults (e"20 years). The specific objectives are as follows:-

1. To assess the food and nutrient intakes among different age/sex/physiological groups in the rural areas.
2. To assess the nutritional status of individuals in terms of anthropomentry and clinical examination.
3. To assess the prevalence of obesity among the adults excluding pregnant women (e"20 years) in terms of BMI, waist circumference and waist-hip ratio.
4. To assess the haemoglobin levels among adult males and non-pregnant and non-lactating (NPNL) women.
5. To assess the prevalence of hypertension among adult men and women of e"20 years of age.
6. To assess the knowledge of adult men and women about hypertension and diabetes mellitus.

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The coverage particulars during this survey is as follow:-

No. of Households enumerated:- 28519, Anthroponetry &clinical examination was done in 5744 individuals i.e. 68% of the target, Haemoglobin estimation coverage among adult males – 393 i.e. 98% of the target and among adult females (NPNL) – 399 i.e. 100% of the target. KAP schedules were administered among 2332 individuals i.e. 97% of the target.

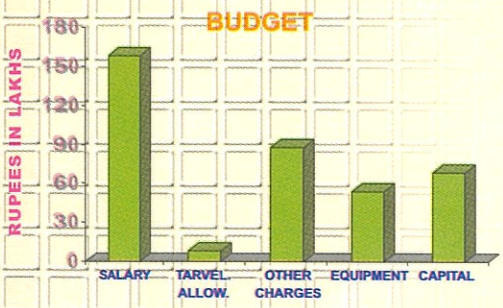
Insectarium

The insectorium facility is maintained at the Centre by Entomology Division by rearing of various stages of vectors used for laboratory studies. Cyclic colonies of three mosquito species i.e. Aedes *aegypti* (black eyed Liverpool strain), *Anopheles stephensi* and *Culex quinquefasciatus* are being maintained.

Cyclic colonies are maintained for conducting different experiments, such as development of different strains and species of filarial worms which will help in the selection of proper animal model and conducting bio-assays of different plant products for observation of its insecticidal properties.

Animal house

Animal facility in the Centre continues to be used under Immunology Division catering to all research projects requiring animal experimentation. Currently Rabbit, *M. couch,* jirds, CBA/N mice, Guinea pigs are available for experimentation. This animal facility has been registered with CPCEA. All the projects concerning animal use experimentation are discussed in duly constituted Animal Ethical Committee of the Centre and work progress review periodically by committee. The facility is well maintained with animal house attendant and other trained researchers. Animal house is maintained regularly with periodic inspection and health monitoring by veterinarian. The newly constructed Animal House facility is likely to be functional very soon.



4.9 Budget and Extramural Grants:

The total sanctioned Budget in respect of the Centre (Non-Plan & Plan) for the year 2004-05 is Rs.399.92 lakhs. The total expenditure made by the Centre for the year 2204-05 Rs.376.48 lakhs. The head-wise expenditure of budget is shown below graph. During this year, 25 extramural projects were under taken at RMRC, Bhubaneswar. The budget for these projects is 88.15 lakhs and it has been generated from both Indian and international funding agencies.

4.10 19th Scientific Advisory Committee

Dr. Sandeep Basu Director, National Institute of Immunology Aruna Asaf Ali Marg, New Delhi 110 067	Chairman
Dr. S. Pattnayak B-91, Swasthya Vihar, Delhi 110 092	Member
Lt. Gen. D. Raghunath Principal Executive, Sir Dorabji Tata Centre for Research in Tropical Diseases, Innovation Centre, IISc Campus, Bangalore 560 012	Member
Dr. Sarita Agarwal Addl. Professor, Deptt. of Genetics, SGPGIMS, Raebareli Road. Lucknow 226 014	Member
Dr. K. Ramachandran Consultant, National Institute of Epidemiology, Chennai	Member
Dr. Ashish Datta Director, National Centre for Plant Genome Research J.N.U. Campus, PO BoX:10531, New Delhi 110 067	Member
Dr. R. Reuben No.52, Rashmi Apartments, 5th Floor, D Monte Part Road, Bandras, Mumbai 400 050	Member

Dr. Indira Chakravarty 110, Chittaranjan Avenue, Kolkatta 700 073	Member
Dr. Era Ray B 265 GKI, New Delhi-110 048	Member
Dr. D.S. Aagarwal B-24, Swasthya Vihar, Delhi 110 092	Member
Dr. Neelima Kshirsagar Professor & Head, K.E.M. Hospital Parel, Mumbai 400 012	Invited Member
Director of Health Services, Govt. of Orissa, Heads of the Dept. Building, Bhubaneswar	Member
Dr. Satish Gupta National Institute of Immunology Aruna Asaf Ali Marg, New Delhi-110 067	DG's Nominee
Dr. Sarala K. Subbarao Ex-Director, MRC Consultant, ECD, ICMR,N.Delhi-29	Invited Member
Dr. A.P. Dash Director, Malaria Research Centre 20, Madhuban, Vikas Marg, Delhi 110 092	Invited Member
Dr. S.K. Acharya All India Institute of Medical Sciences, New Delhi	Invited Member
Dr. Lalit Kant Sr. DDG, Indian Council of Medical Research Ansari Nagar, New Delhi 110 029	ICMR Representative
Dr. Dipali Mukherjee DDG (SG) & Chief, ECD Indian Council of Medical Research Ansari Nagar, New Delhi 110 029	ICMR Representative
Dr. Rashmi Arora DDG (SG), ECD-II Indian Council of Medical Research Ansari Nagar, New Delhi 110 029	ICMR Representative
Dr. S.K. Kar Director, Regional Medical Research Centre (ICMR) Bhubaneswar	Member Secretary

4.11 Human Ethical Committee:

1.	Justice (Mrs.) A.K. Padhi Former Judge, Orissa High Court 10, Bhasakosh Lane, Nimchouri, Cuttack-753 002	Chairman
2.	Dr. B B. Tripathy Retd. Prof. of Medicine Saradiya Mission Road, Cuttack-753 001	Member
3.	Dr. (Mrs.). P. Mohanty Hejmadi Former V.C., Sambalpur University GM-8, VSS Nagar, Bhubaneswar-751 004	Member
4.	Mrs. Kasturika Pattanayak Ex-Chair Person, Social Welfare Board Govt. of Orissa, 1, Lewis Road, Bhubaneswar	Member
5.	Dr. (Mrs.) Manorama Das C/o. Prof. G.C.Das, Santiniketana, Mathasahi, Cuttack	Member
6.	Dr. S.K. Kar Director, Regional Medical Research Centre, Bhubaneswar	Member-Secretary

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4.12 Animal Ethical Committee:

1.	Dr. S.K. Ray Professor & Head, Dept. of Veterinary Medicine Orissa College of Animal Husbandry & Veterinary Sciences, O.U.A.T., Bhubaneswar – 751 001	Chairman
2.	Dr. G.B.N. Chainy Professor & Head, Dept. of Zoology Utkal University, Bhubaneswar – 751 004	Member
3.	Prof. P.C. Supkar Institute of Life Sciences, Bhubaneswar-751 023	Member
4	Fr. S.J. Abrham Director, Xavier Institute of Management Bhubaneswar-751 023	Member
5	Mr. N.R. Mansingh Inspector, SPCA, C/o. CDVO office, Puri – 752 002	Nominee of the CPCSEA
6	Dr. M.K. Das Deputy Director (Sr. Gr.), RMRC, Bhubaneswar	Biological Scientist
7.	Dr. B. Ravindran Deputy Director (Sr. Gr.) RMRC, Bhubaneswar	I/C Animal facility
8.	Dr. (Mrs.) N. Mohapatra Assistant Director, RMRC, Bhubaneswar	Biological Scientist
9.	Dr. S.K. Kar Director, RMRC, Bhubaneswar	Convener

4.13 Technical Equipment Purchase Committee:

1.	Dr. A.K. Sahoo Principal Scientist CIFA, Kausalya gang, Bhubaneswar- 751 002	Chairman
2.	Prof. P.C. Supakar Director-in- Charge Institute of Life Sciences, Bhubaneswar-751 023	External Member
3.	Dr. A. Padhi, MD Pathologist, Kalinga Hospital, Bhubaneswar	External Member
4.	Dr. Pankaj Agarwal Lecturer, Institute of Physics, Bhubaneswar	External Member
5.	Mr. A.K. Mohapatra AO, RMRC, Bhubaneswar	Member
6.	Mr. R.V.Rao, ACO, RMRC, Bhubaneswar	Member
7.	Dr. B. Ravindran, DD (SG) RMRC, Bhubaneswar	Member (Subject Specialist)
8.	Dr. M.K. Das, DD (SG) RMRC, Bhubaneswar	Member- Secretary

4.14 Technical Building Maintenance Committee:

1.	Mr. D.N. Tripathy Retd. Chief Engineer, CPWD	Chairman
2.	Mr. P.K. Pattanik Retd. Sup. Eng. (Elect.), CPWD	Member
3.	Mr. P. Kapoor Retd. Jt. Director (Agriculture)	Member
4.	Dr. B.V. Babu Assistant Director, RMRC	Member
5.	Dr. A.K.Satapathy Senior Research Officer, RMRC	Member
6.	Mr. R.V. Rao Accounts Officer, RMRC	Member
7.	Mr. G. Behera Section Officer, RMRC	Member

4.15 Staff position

DIRECTOR

DR. S.K. Kar, MD

IMMUNOLOGY DIVISION

Dr. M.K. Das, M.Sc., Ph.D.	Deputy Director (Sr. Gr.)
Dr. B. Ravindran, M.Sc., Ph.D.	Deputy Director (Sr. Gr.)
Dr. M.K. Beuria, M.Sc., Ph.D.	Senior Research Officer
Dr. A.K. Satapathy, M.Sc., Ph.D.	Senior Research Officer
Mr. N. Mandal, M.Sc., M.Phil., B.Ed.	Research Assistant
Dr. P. K. Sahoo, M.Sc., Ph.D.	Research Assistant
Dr. (Mrs.) M.S. Bal, M.Sc.,M.Phil., Ph.D.	Research Assistant
Mr. H.S. Naik, Dip. MLT	Lab. Technician
Mr. K.C. Parichha	Insect Collector
Mr. S.C. Das	Lab. Attendant

Students:

Mr. B.R. Sahu, M. Sc. M. Phil	SRF
Mr. Alok Das Mohapatra, M. Sc.	SRF
Mr. Santosh Kumar Panda, M. Sc.	JRF
Mr. Aditya Kumar Panda, M. Sc.	JRF

PATHOLOGY AND MICROBIOLOGY DIVISION

Dr G P Chhotray, M.D.	Deputy Director (Sr.Gr.)
Dr. M.R. Ranjit, M.Sc., Ph.D.	Senior Research Officer
Dr. B.B. Pal, M.Sc., Ph.D.	Senior Research Officer
Mr. H.K. Khuntia, M.Sc.	Research Assistant
Mr. R.K. Das, M.Sc.	Research Assistant
Mr. B.N. Sethi, Dip. MLT	Lab. Technician
Mr. K.C. Dalai, B.A., ITI	Lab. Assistant
Mr. B.K. Kanhar	Lab. Assistant
Mr. C.R. Samantray	Lab. Assistant
Mr. K.C. Jena	Laboratory Attendant
Mr. S. K. Mallick	Lab. Attendant

Students

Mr. Sudhansu Sekhar Nishank, M. Sc.	JRF

CLINICAL, EPIDEMIOLOGY AND STATISTICS DIVISION

Dr.S.S.S. Mohapatra, M.B. B.S.	Deputy Director
Dr.B.V.Babu, M.A., Ph.D., PGDAS	Assistant Director
Dr. A. Mohapatra, M.Sc., M.Phil., Ph.D.	Senior Research Officer
Dr. (Mrs.) A.S. Kerketta, M.B. B.S.	Senior Research Officer
Dr. Bhagirathi Dwibedi, M.B.B.S, M.D	Research Officer
Mr. P.K. Jangid, M.Sc.	Statistical Assistant
Dr. A.S. Acharya, M.Sc., M.Phil, LL.B.,Ph.D	Research Assistant
Mr. D.P. Hansdah, M.Sc.	Research Assistant
Mr. R.C. Parida, M.Sc.	Research Assistant
Mr. S.C. Rout	Lab. Technician
Mr. T. Moharana	Lab. Assistant
Mr. R.N. Nayak, B.A.	Census Taker
Mr. K. Dhal, B.A.	Census Taker
Mr. N.N. Pattnaik	Laboratory Attendant
Mr. H.K.Jena	Field Attendant
Mr. K.C. Nayak	Sweeper

MEDICAL ENTOMOLOGY DIVISION

Dr. (Mrs.) N. Mohapatra, M.Sc., Ph.D.	Assistant Director
Dr. R.K. Hazra, M.Sc., Ph.D.	Senior Research Officer
Dr. S.K. Parida, M.Sc., Ph.D.	Technical Officer
Mr. N.S. Marai, M.Sc., LL.B.	Research Assistant
Mr. H.K. Tripathy, B.Sc, PGDME	Technical Assistant
Mr. G.D. Mansingh	Insect Collector
Mr. B. Pradhan	Insect Collector
Mr. C.S. Tripathy, B.Com. LL. B.	Insect Collector
Mr. S.S. Beuria	Insect Collector
Mr. G. Simhachalam	Insect Collector
Mr. Banamali Nayak	Field Attendant

Information & Publication

HUMAN GENETICS DIVISION

Dr. R.S. Balgir, M.Sc. (Hons.), Ph.D.	Deputy Director(Sr. Grade)
Dr. G. Bulliyya, M.Sc., Ph.D.	Senior Research Officer
Dr. B.P. Dash, M.Sc., Ph. D.	RA (on deputation w.e.f. 23.02.2005)
Mr. B. Murmu, M.Sc., M.Phil.	Research Assistant
Mrs. G. Mallick, M.Sc.	Research Assistant

LIBRARY & INFORMATION

Dr. B. Sahoo, M.L.I.Sc., Ph.D.	Asst. Lib. & Inf. Officer
Mr. Chakradhar Naik	Sweeper o Attendant
Mr. R.S. Bahadur	Watchman

ADMINISTRATION

Mr. A.K. Mohapatra, B.A., LL.B.	Administrative Officer
Mr. G. Behera, M.A.	Section Officer
Mr. R.C. Muduli, B.A.	Assistant
Mr. P.C. Nayak, B.A.	Personal Assistant
Mr. Abani K. Nayak, B.Com.	Personal Assistant
Mr. A.P. Parida, B.A.	U.D.C.
Mr. B.S. Rao	U.D.C.
Mr. S. Nayak	L.D.C.
Mr. R. Rath	L.D.C.
Mr. S.K. Das, B.Com.	L.D.C.
Mr. S.K. Majhi, M.A., LL.B.	L.D.C.
Mr. N.C. Dash	Office Attendant
Mr. Sankar Prasad Sharma	Watchman
Mr. M.B. Thappa	Watchman
Mr. R.S. Rai	Watchman
Mr. Som P. Sharma	Watchman
Mr. T. Bahadur	Watchman

Directors' Office

Mr. L.S. Rao, B.A.	Private Secretary
Mrs. R. Varghese	Steno
Mr. K.G. Samal	Attender
Mr. R.K. Hembram	Field Attendant

ACCOUNTS

Mr. R.V. Rao, B.Com.	Accounts Officer
Mr. B. Sutar, M.Com.	Assistant
Mr. S.K. Satapathy	U.D.C.
Mr. D. Chinna Rao	Sweeper

WORKSHOP, INSTRUMENT & BUILDING MAINTENANCE

Mr. B.K. Biswal	Electrician
Mr. S. Sutar	Generator Operator
Mr. J. Behera	Pump House Operator-cum-Wireman
Mr. B.K. Moharana	Plumber-c-Carpenter
Mr. Banamali Sahoo	Gardener
Mr. Sankar Bisoi	Cook-cum-Guest House Attd.

ANIMAL FACILITY

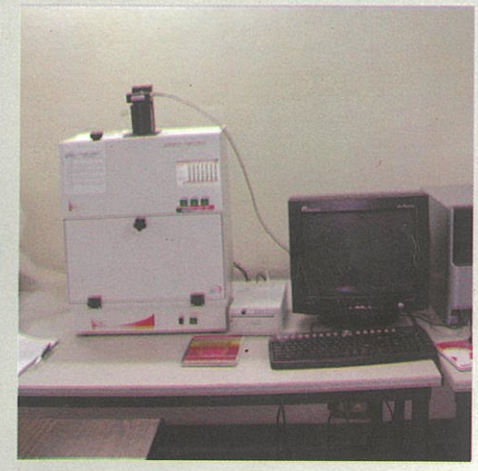
Mr. A. Senapati	Animal House Attendant
Mr. S.K. Das	Animal House Attendant
Mr. Jaladhar Naik	Animal House Attendant
Mr. Pandav Sahoo	Animal House Attendant

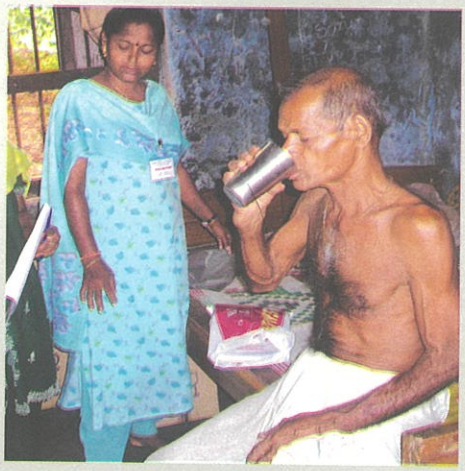
TRANSPORT

Mr. Md. Daulat Khan	Driver (Special Grade)
Mr. Sibaram Patra	Driver (Grade-I)
Mr. R. Pradhan	Driver (Grade-I)
Mr. Anakar Nayak	Driver (Grade-II)
Mr. A.R. Khan	Driver (Grade-II)
Mr. P.K. Behera	Driver

NATIONAL NUTRITION MONITORING BUREAU (NNMB) STAFF

Dr. S.K. Das, MBBS	Research Officer (Medical)
Mrs. S. Paikray	Asst. Research Officer
Mrs. Haraprava Sahu	Social Worker
Mr. D.K. Mohanty	Steno-C-Office Asst.
Mr. R.K. Sahoo	Driver
Mr. J.K. Mohanty	Field Attendant





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