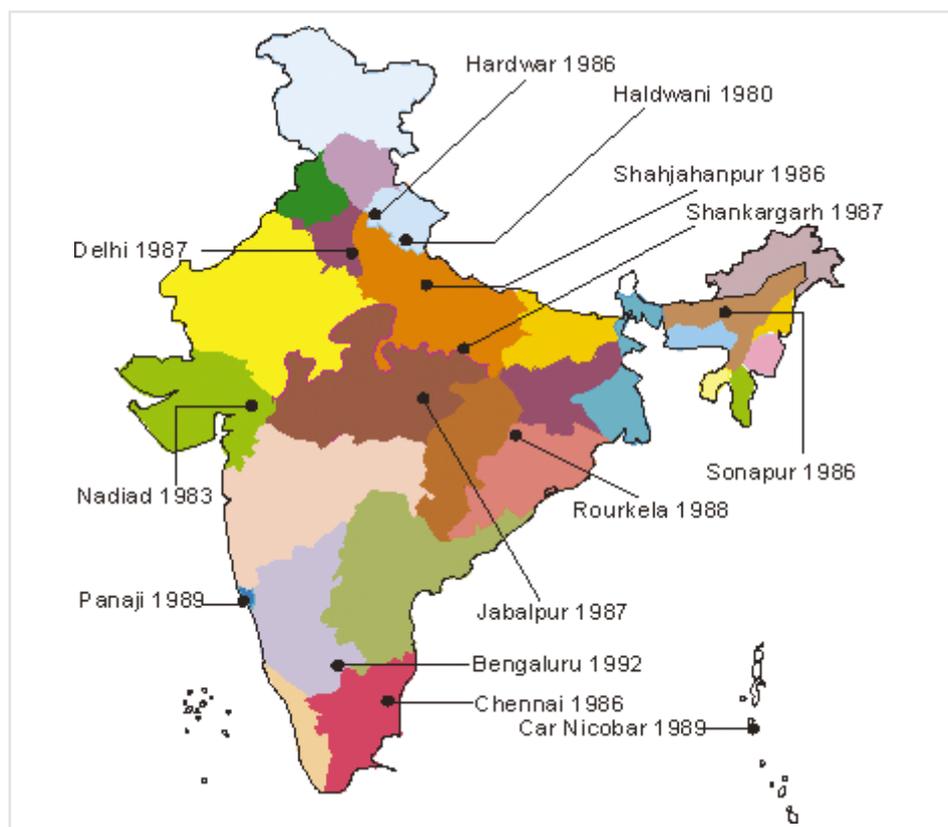


# Introduction

The return of malaria in the 1970s on a nationwide scale forced endemic countries to switch back from malaria eradication strategy to that of malaria control with a major aim to reduce morbidity and mortality due to malaria. In India, the National Malaria Eradication Programme (NMEP) (now renamed as National Vector Borne Disease Control Programme) launched a revised malaria control strategy known as the Modified Plan of Operation (MPO) in 1977. Resources under the MPO were inadequate and the infrastructure was insufficient to respond to the challenges in malaria control. The scientific community felt that a massive undertaking such as NMEP could not accomplish the goals of malaria control without a strong research support. In response to the challenge of re-emergence of malaria, the Indian Council of Medical Research (ICMR) reviewed the malaria situation and identified priority areas of

research. Time bound research projects in specific fields of malaria were funded from the extra-mural grant of ICMR. Simultaneously in 1977, ICMR established the Malaria Research Centre (MRC) in Delhi to conduct basic and applied research, undertake field research in malariology and help to develop trained man power in the country. The Malaria Research Centre was renamed as National Institute of Malaria Research (NIMR) on 4 November 2005.

The research activities at NIMR were directed towards developing new and innovative practical methods of malaria control. The primary task was to find short-term as well as long-term solutions to the problem of malaria through basic, applied and operational field research. Therefore, the Institute focused its research activities on vector biology and control, genetics, cellular and molecular biology,



**Fig. 1: Location and year of establishment of IDVC field units before re-organization**

parasitology, biochemistry, pharmacology and epidemiology. A major programme on operational field research was also taken up by NIMR under the Science and Technology Project on the Integrated Control of Malaria, Filariasis and other Vector-borne Diseases. This project referred to as Integrated Disease Vector Control (IDVC) was launched in 1985 and its activities are spread over in many eco-epidemiological zones of the country. The IDVC project evaluated non-insecticidal methods for disease vector control, such as environmental modification and manipulation coupled with biological control of aquatic stages of vectors. In this approach, intersectoral collaboration, community involvement and cooperation were the key factors. The feasibility of this alternative strategy of malaria control was evaluated at 12 field sites (as shown in Fig.1), namely—Nadiad (Gujarat), Sonapur (Assam), Haldwani and Hardwar (Uttarakhand), Shahjahanpur and Shankargarh (Uttar Pradesh), Chennai (Tamil Nadu), Jabalpur (Madhya Pradesh), Rourkela (Orissa), Panjim (Goa), Car Nicobar (Andaman & Nicobar Islands) and Bengaluru (Karnataka).

A field unit in Delhi was also opened to control mosquito nuisance and malaria and to coordinate the activities of the field units. In March 2006, with the approval of the Ministry of Health and Family Welfare, the IDVC project was re-organised into ten

field units (Fig. 2). The field units at Haldwani, Shahjahanpur, Shankargarh, Car Nicobar and Delhi were closed and two new field units at Ranchi (Jharkhand) and Raipur (Chhattisgarh) were opened.

Major areas of research undertaken by NIMR include mosquito fauna surveys, development of simple identification keys for adults and larvae, development of genetic maps using phenotypic and biochemical markers for important malaria vectors, cytotaxonomic studies for the identification of species complexes, laboratory and field studies to examine the biological variations among sibling species, development of molecular identification techniques for sibling species, monitoring of insecticide resistance through space and time, evaluation of new insecticides and biological control agents for vector control and reduction in malaria, evaluation of herbal products as mosquito repellents and larvicides, GIS and RS as tools to map the distribution and breeding site delineation of malaria vectors, etc. Malaria parasite bank has provided a rich resource of malaria parasites for various studies. These studies include molecular and biochemical characterization of parasites, drug resistance mechanisms, evaluation of new molecules/compounds for their antimalarial activity, parasite invasion and adherence mechanisms, etc. Epidemic investigations, clinical drug trials, monitoring of drug resistance, health impact



**Fig. 2: Location and year of establishment of IDVC field units after re-organization in March 2006**

assessment studies at developmental projects, preparation of action plans, etc. have yielded valuable information. Field evaluation of new insecticides, biolarvicides, insecticide impregnated bednets, long-lasting insecticidal nets and materials, drugs and parasite diagnostic kits have provided new armamentarium to malaria control and many of which have found place in the national malaria control programme. Malaria clinics at the headquarters and field units provided excellent diagnosis and treatment facilities to patients which made them very popular and many drug trials could be conducted very easily. Malaria clinics are also providing biological material for research.

At the field units feasibility and economic viability of bioenvironmental interventions was demonstrated in the control of industrial malaria at BHEL complex, Hardwar and IDPL, Rishikesh; rural malaria in Kheda, Shahjahanpur, Haldwani and Shankargarh; urban malaria in Chennai, Goa and Ahmedabad; and coastal malaria in Car Nicobar Islands. In areas not amenable to bioenvironmental interventions, such as in Sonapur (Assam), Rourkela (Orissa) and Mandla (Madhya Pradesh) insecticide treated bednets were highly successful. The network of field laboratories in endemic areas is serving as testing ground for new technologies and helping in the transfer of technology through field demonstrations.

Another important mandate for NIMR is man power development and transfer of technology to the end users. This was achieved very effectively by organizing training courses, workshops and meetings with health personnel and community. Audio-visual programmes/documentaries developed by the Institute are extensively used in training courses and to create community awareness. These are also being used by the State Health Officers in their training programmes. Several candidates have

pursued post-graduate and doctoral research at NIMR that led to award of degrees by the national and international universities and institutions of higher learning.

Scientists of NIMR have participated in collaborative research and multinational training courses with several international organizations, undertaken consultancy assignments with WHO and other organizations, served as members of steering and expert committees and task forces, and have been invited to deliberate upon issues of topical interest in several scientific forums.

At the national level, scientists of NIMR have participated in planning of malaria control, in the in-depth reviews of the MPO/NVBDCP, reviewed the research projects in the background of current priorities, provided support for the expansion of malaria research in sister institutions by providing biological material and technical expertise. NIMR has undertaken research and training activities in consonance with the Global Malaria Control strategy and is an active partner in the Roll Back Malaria programme. The Institute had a number of fruitful collaborations with the R&D industry in evaluating the new drugs, insecticides and other tools and looks forward to more of these partnerships in future.

The studies carried out at the NIMR are interdisciplinary, cutting across classical entomology, parasitology, epidemiology, genetics, immunology, biochemistry and molecular biology with the state-of-the-art tools and analytical procedures. Field operational researches are carried out following the national and international guidelines. Over the years, NIMR has carried out novel researches and the outcome of these researches found place in the planning and implementation of malaria control activities.

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