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Introduction

Return of Malaria

Malaria is a major public health problem in India and the entire country is at risk of malaria except areas 1700 m above mean sea level. During the pre-DDT era, in the late 1940s, nearly 22% of the population or every fifth person used to suffer from malaria every year. Therefore, malaria control was given top priority and a malaria control programme was initiated in 1953 which was converted into an eradication programme in 1958. The strategy of eradication was based on interruption of malaria transmission by indoor residual insecticidal (IRS) spraying together with case detection and treatment. By the mid-1960s, progress was spectacular and malaria incidence was reduced to about one lakh cases and no deaths as against an estimated 75 million cases and 0.8 million deaths in 1948. Nearly 54% of the malaria endemic areas were made malaria-free. But malaria resurgence was widespread and gradually the number of malaria cases reached a record of 6.4 million cases in 1976. Malaria epidemics were also reported in so called malaria-free areas. Malaria became a serious public health challenge in urban areas. A revised strategy under the Modified Plan of Operation (MPO) was launched in 1977. MPO resulted in the improvement of malaria situation. However, malaria control became difficult due to insecticide resistance of malaria vec-

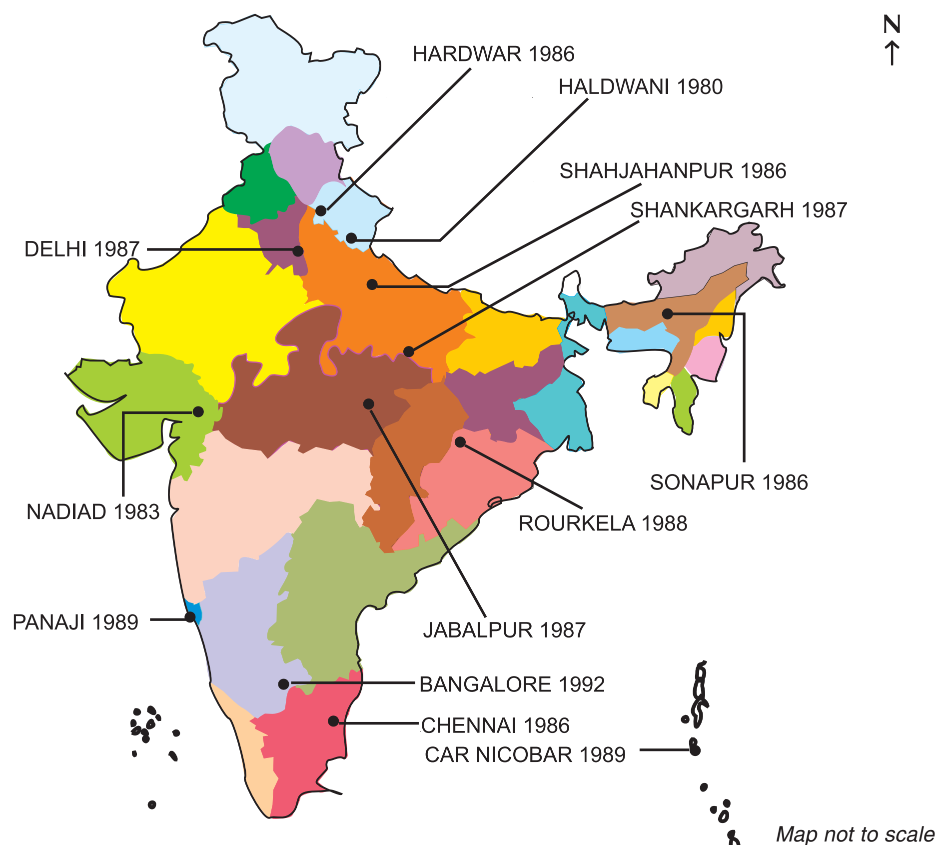

Fig. 1: Location of IDVC field units and their year of establishment before reorganisation

tors, chloroquine resistance of *P. falciparum*, operational problems and financial constraints. Since epidemics were being reported from areas under spraying, there was an urgent need for an alternative technology which would be cost-effective, socially acceptable, use simple and doable technologies and least rely on insecticides.

Revival of research on malaria

With the near eradication of malaria by mid-1960s, all research on malaria was wounded up and the publication of *Indian Journal of Malariology* was terminated. Following resurgence of malaria, research on malaria in the country was revived. In 1977, Malaria Research Centre (ICMR) was opened and NMEP funded projects to strengthen MPO. During the next 15 years, malaria research was initiated in many universities, medical colleges, research institutes under the ICMR, CSIR, DRDO, ICGEB and the private sector. Malaria Research Centre launched the Integrated Disease Vector Control Project at 12 locations in the country. In addition, ICMR also provided support to extramural research on malaria.

Development of alternative strategy — the IDVC

Malaria Research Centre (now National Institute of Malaria Research) took up the first bioenvironmental malaria control demonstration project in 1983 in high malaria incidence villages of Kheda district, Gujarat. The strategy used non-insecticidal methods of vector control. The main components of strategy comprised of environmental management methods such as drainage, filling, leveling, mosquito proofing, soak-away pits, use of larvivorous fishes, case detection and treatment to eliminate parasite reservoir, inter-sectoral coordination and community participation, etc. Vector control interventions were integrated with social forestry to eliminate marshy areas and improve the environment, promotion of alternate sources of energy like the solar cooker and smokeless *chulhas* (stoves). Efforts were made to start income-generating schemes such as food fish production in village ponds and promotion of cottage industries. These schemes were introduced to increase the income of individuals and *panchayats* for the holistic develop-

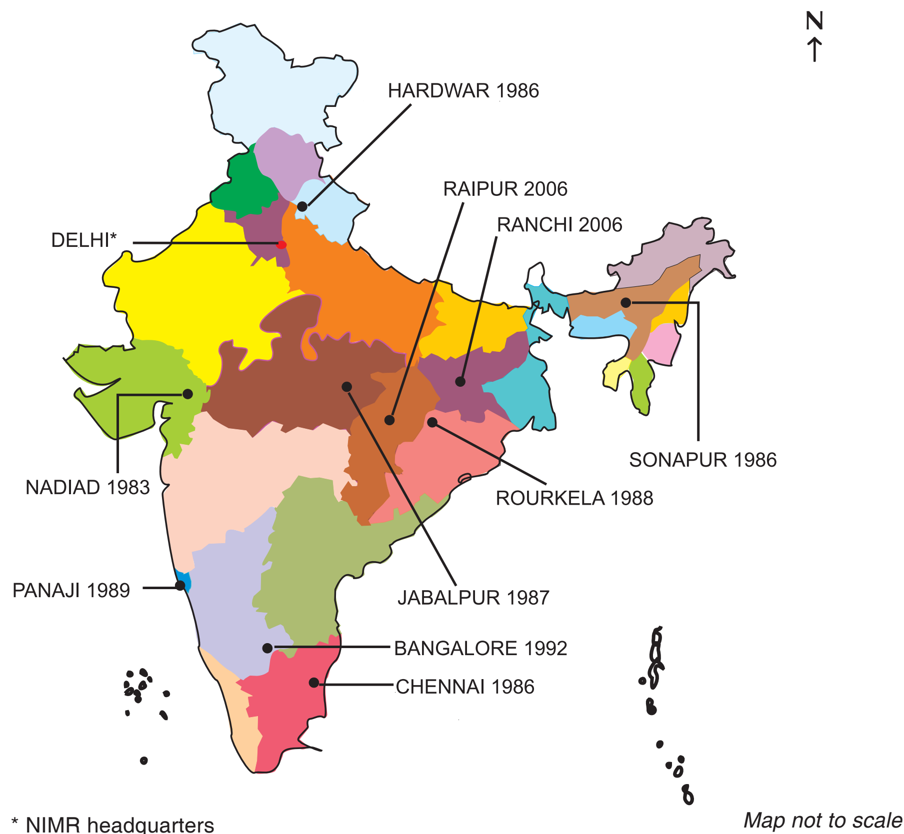

Fig. 2: Location of IDVC field units after reorganisation (2006)

Table 1: Details of field units established in different eco-epidemiological settings

Location (State)/Year of establishment	Ecotype	Main malaria vectors	Predominant malaria parasite species
Existing field units			
1. Nadiad (Gujarat) 1983 and with IDVC activities since 1985	Irrigated plains	*An. culicifacies*	*P. vivax*
2. Hardwar (Uttaranchal) 1986	Industrial area	*An. culicifacies*	*P. vivax*
3. Sonapur (Assam) 1986	Hilly forests	*An. minimus*	*P. falciparum*
4. Rourkela (Orissa) 1988	Hilly forests and mining area	*An. fluviatilis, An. culicifacies*	*P. falciparum*
5. Panaji (Goa) 1989	Developing urban area	*An. stephensi*	*P. vivax*
6. Chennai (T.N.) 1986	Urban area	*An. stephensi*	*P. vivax*
7. Jabalpur (M.P.) 1987	Hilly forests	*An. culicifacies, An. fluviatilis*	*P. falciparum*
8. Bangalore (Karnataka) 1992	Semi-arid plains	*An. culicifacies*	*P. vivax*
9. Raipur (Chhattisgarh) 2006	Forested plateau	*An. culicifacies, An. fluviatilis*	*P. falciparum*
10. Ranchi (Jharkhand) 2006	Hilly forests	*An. culicifacies, An. fluviatilis*	*P. falciparum*
Field units closed			
1. Delhi 1987*†	Urban slum clusters	*An. stephensi*	*P. vivax*
2. Shankargarh (U.P.) 1987†	Stone quarry plains	*An. culicifacies*	*P. vivax*
3. Shahjahanpur (U.P.) 1986†	Riverine plains	*An. culicifacies*	*P. vivax*
4. Haldwani (Uttaranchal) 1980 and with IDVC since 1986†	Foothills and terai plains	*Anopheles culicifacies*	*P. vivax*
5. Car Nicobar (A&N Islands) 1989†	Island	*An. sundaicus*	*P. vivax*

*Delhi field unit was established for the control of mosquito nuisance; †Project concluded in 2006.

ment of villages. It is noteworthy to mention that public acceptance and people's participation in the scheme were phenomenal. The project was periodically evaluated by the national and international experts with commendable observations.

At the instance of the Hon'ble Prime Minister of India, the Kheda project became part of the "Integrated Disease Vector Control of Malaria, Filariasis and other Vector Borne Diseases", which was assigned to Malaria Research Centre (MRC), Delhi.The IDVC project was launched by joint funding from the Indian Council of Medical Research, New Delhi and the Ministry of Health and Family Welfare, Govt. of India. As the project was to be implemented in a multi-centre mode, MRC identified 13 locations for testing the feasibility of demonstrating malaria control by the bioenvironmental methods. Nadiad in Gujarat state and Haldwani in erstwhile Uttar Pradesh state , where field units of MRC were already functioning, were assigned the IDVC project work and 11 new field units were opened between 1986 and 1992 in consultation with the National Malaria Eradication Programme [now renamed as the National Vector Borne Disease Control Programme (NVBDCP)], Delhi. The main criteria for the site selection were presence of high incidence of malaria, deaths due to malaria, drug resistance, vectors refractory to insecticides, factors related to human ecology and settlements, and different eco-epidemiological settings. The locations of field units are shown in Fig.1. Details of establishment of field units are given in Table 1. In March 2006, with the approval of the Ministry of Health and Family Welfare, the IDVC project was reorganised into 10 field units as shown in Fig. 2.