Roll back malaria

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World Health Organization (WHO) has announced Roll Back Malaria (RBM) initiative aimed to halve malarial deaths by 2010 and again halve by 2015. The approach would be global with spearhead in Africa. The existing techniques in malaria control should be used with political commitment at the highest level. This is an admirably courageous initiative seen in the background of deteriorating malaria situation in the world. WHO estimates 1.7–2.5 million deaths, 300–500 million cases each year. Nine out of 10 deaths occur due to malaria in Africa, south of Sahara. Malaria is a major obstacle in the development and prosperity of nations. Success in malaria control is impeded by the drug-resistant parasites which have disseminated far and wide and have impacted enhanced mortality. Reliance on chemotherapy in the absence of transmission control is further compounding the problem. Drugs to treat resistant malaria are expensive and encourage the use of traditional medicines and counterfeit drugs. Malaria vectors have become multiple resistant or avoid contact with sprayed surfaces. Spraying lacks sustainability and has awakened concern to human health and environment. Malaria epidemiology is complex and requires local knowledge of the transmission dynamics. RBM envisages a more skilled approach to malaria control by using the existing technologies of improved surveillance, early case detection and treatment, enhanced capability to address the problems at the periphery, personal protection with insecticide-treated mosquito nets, lessons from past experience, environmental interventions and multisectoral partnership, etc. Pharmaceutical companies and scientists would be encouraged to develop *inter alia* new drugs and vaccines.

In India, the malaria eradication concept was based on indoor residual spraying (IRS) to interrupt transmission and mop up cases by vigilance. Areas free of malaria were transferred to the maintenance phase under the general health services. Return of malaria in the 1970s brought about policy changes and the eradication programme was converted to that of control under the Modified Plan of Operation (MPO). In the past, the National Malaria Eradication Programme (NMEP) has been strengthened from time to time by various initiatives such as the *P. falciparum* Containment Programme (PfCP), external assistance from the World Health Organization (WHO), United Nations Educational Scientific and Cultural Organization (UNESCO), Department For International Development (DFID), etc. and more recently by World Bank (WB) assistance. There have been no policy changes in malaria control and major reliance has been on the IRS and drugs. This has already resulted in vector and parasite resistance.

In-depth evaluation of NMEP (1985) observed that the incidence of malaria in India is grossly under-reported. World Bank estimated 0.95 million disability adjusted life years (DALY) for malaria in India (1990). Estimates based on chloroquine consumption gave a figure of 38 million cases (1995). NMEP reports ca. 2.5 to 3.2 million parasite positive cases and about 1,000 malarial deaths. South East Asia Regional Office of the WHO estimates 15 million cases and 19,500 deaths annually in India. Nearly 219 million population and 29 urban areas have been identified as high risk requiring special attention. The mainstay of rural malaria control is IRS. It is estimated that 23.2% Indian villages come under the category of high risk population. IRS provides protection to ca. 50% population in high risk villages. The Urban Malaria Scheme (UMS) was launched in 1971–72 and covers 131 towns. Despite this, urban malaria situation has deteriorated rapidly. In 1997, NMEP had identified 29 towns reporting > 10 SPR for intensified control under the Enhanced Malaria Control Project (EMCP). Basic reproduction rate of malaria in this vulnerable rural and urban population is high and therefore more epidemics may be in the offing. Vector control has been the bane of malaria but of late it has not been productive in reversing malaria trends. HCH has been banned, DDT is not effective in curtailing transmission to acceptable levels, and it is also on the list of chemicals to be banned. Malathion has bad pungent odour and therefore refusal rates are high. Currently synthetic pyrethroids (SP) have been introduced for IRS. *An. culicifacies*, the most important vector of rural malaria has already started showing incipient resistance in some areas. Synthetic pyrethroids are not recommended in areas under consideration for the insecticide-treated mosquito net programme (ITMN). Malathion and SP compounds are expensive and spraying cost is generally 6 to 7 times higher than DDT with trends of further cost escalation. In urban areas the programme is largely that of mosquito control rather than emphasizing species sanitation. Municipal bye-laws are not operative in most urban areas. In towns with < 50,000 population, IRS is not feasible and UMS is not operative. Poor vector control is being supplemented by free drug distribution to reduce malaria-related morbidity and mortality. Sustained reliance on anti-malarial drugs is likely to intensify multiple drug resistance. A worsening of the malaria situation is likely to emerge with the rise in *P. falciparum*, and drug resistance in *P. falciparum* and *P. vivax*. Diagnosis of *P. falciparum* by ICT/Dip Stick is useful but expensive and may cost > Rs 150 (US$ 3.5) per test. Currently these tests do not detect *P. vivax*. Diagnosis of drug-resistant malaria is difficult and often based on the likely place of contracting the infection in areas known for drug resistance. Replacement drugs to treat resistant malaria and serious malaria episodes are few and expensive. Environmental change has led to ecological succession of malaria vectors and the creation of new malaria ecotypes requiring specialized training in control. A paradigm shift to man-made malaria already accounts for > 60% cases. Economic loss due to malaria may be ca. US$1 billion annually besides enormous loss due to rejection of food exports. There are no new technologies on the horizon that are likely to change this scenario in the near future. Chemical vector control produces diminishing returns and lacks social acceptability. Nevertheless, available

Table 1. Bioenvironmental vs chemical malaria control strategy

Concern	Bioenvironmental control	Chemical control
Impact	+	–
Malaria	Long term	Seasonal
Vectors	Long term	Seasonal (R)
Parasite (R)	–	+
Human Health	+	–
Environment	+	–
Sustainability	+	–
Cost	Low to high	High
Returns	+	Diminishing
Skills	Local	Training
Technology	Local and universal	Sophisticated and time limited
Gains	+	?
Other diseases	+	–
Development	Linked	Isolation
Indian ethos	+	–
Community	+ Response	? Response

+, Positive; –, Negative; R, Resistance; ?, Doubtful.

vector control techniques are still useful but demand higher skills in planning and implementation. The challenge is how best to integrate various malaria control methods to obtain sustainable impact on malaria transmission. RBM initiative is a reminder of tremendous opportunities that lie ahead in the control of resurgent malaria.

How do we interpret RBM initiative for India at a time when epidemics are more frequent and the march of drug resistance is relentless? In the given situation, control of drug-resistant malaria should be the first priority, as one-third *P. falciparum* cases show some degree of resistance to chloroquine, and multiple resistant strains are also encountered. IRS using an effective insecticide should interrupt transmission. Anti-malaria drug policy should target attack on the gametocytes by changing drug policy to include 45 mg primaquine (PQ) during presumptive treatment with full course of an effective schizontocidal drug. A new gametocytocidal drug CDRI 80/30 is likely to be introduced soon in place of PQ because of its 5-fold safety in G6PD deficient cases. Drug availability at the periphery must be ensured and treatment facilities at the Primary Health Centres and referral levels upgraded to handle serious and complicated malaria cases. This strategy would contain the transmission of drug-resistant malaria, prevent deaths due to malaria and ensure equity in health delivery. Following the malaria epidemic in a population of 1.2 million in three districts of north Gujarat, the Government of Gujarat has announced the establishment of an Epidemic Forecasting Research Institute (EFRI) in Ahmedabad. The institute would initially function as an Epidemic Forecasting Centre (EFC) financially supported by the DFID for 3 years beginning October 1998, and will later be taken over by the EFRI. DFID is developing rapid response mechanisms in Gujarat to support the EFC/EFRI forecasting and abort the epidemics.

Sustainable malaria control should be the guiding principle of malaria control under the RBM. Table 1 gives a comparison of the bioenvironmental vs. chemical control. The obvious choice is bioenvironmental control, although selective spraying is also useful. The first line of attack on mosquitoes should rely on the broad principles of sanitation and hygiene. This would require detailed studies on health impact assessment to establish the cause of malaria at the local level. The planning to control malaria should be driven by inviting multisectoral partnership and setting up of coordination committees under a senior authority at the centre, state and district levels. This should include the control of malaria and other vector-borne diseases with key sectors, e.g. Irrigation Department to control malaria and filaria vectors; Agriculture Department to control malaria, filaria and Japanese encephalitis vectors; Public Works Department and construction agencies to control malaria, filaria and dengue vectors; Drainage Department to control nuisance mosquitoes, etc. The committee should have over-riding powers to ensure speedy implementation of preventive and corrective measures. Health departments should spearhead the programme as they would stand to gain by sharing work and cost with partners, and the creation of much wider base of health infrastructure in the country. Similar coordination committees should be set up in all towns under the local government and in some identified projects.

The concept of preventive malaria control should percolate as a top down approach to *Panchayats* and communities should be the major players from the very beginning. In urban and industrial townships, legislative measures and building bye-laws should be instituted with punitive action for the defaulters. Surveillance should be intensified to ensure early case detection and prompt radical treatment. Primary health care system should be strengthened to cater to the medical needs at the periphery. Transmission control should rely on the bioenvironmental interventions for long-term gains in malaria control. ITMN may be introduced in areas not amenable to environmental interventions. Selective IRS and rapid response to abort epidemics should be in place. Information, education and communication should be targeted to bring awareness and facilitate implementation of interventions and drug compliance. Teaching about malaria, its control and prevention should be made mandatory in schools and engineering institutions. Training should be specific to meet the needs of job requirements, e.g. training in ITMN, malaria ecotypes like urban, industrial, forest, rural malaria, engineering methods of malaria control, sociological and economic needs of the programme, etc. Implementation of the RBM would require re-organization of malaria control, assignment of responsibilities and accountability at various nodal points in the hierarchy of the health services and development sectors. An outcome of the RBM would be sustainable malaria control, better health, improved environment and enhanced national productivity.

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