

Malaria and poverty in India

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Malaria is endemic in India and its control has become a formidable task. The Planning Commission of the Government of India estimates that 26.1% of the population of India lives below the poverty line. We have examined during 1999–2000, the status of malaria since 1965 in states below the poverty line. Reduction in poverty to about half since 1970 resulted in improvement in the situation in well-performing states. In contrast, the situation either deteriorated or remained unchanged in states with populations exceeding the national average. Malaria control by chemicals is failing because of its transient nature and the convergence of many inherent technical and financial problems, thus making malaria control more refractory and its treatment enormously expensive. Sustainable control requires that the twin problems of poverty and environment be addressed in a holistic manner.

In the world today 1.3 billion people still live in poverty, 840 million suffer from hunger and 2 billion are malnourished¹. Seventy per cent of the poor are Asians, and half of the developing world's poor live in South Asia². More than half of the world's malnourished and underweight children live in South Asia. South Asian countries carry the double burden of disease and poverty, establishing a seemingly endless vicious circle of disease–low productivity–poverty–disease. Malaria is one of the most important public health problems with which India is confronted perennially, and there are no signs of its abating.

Two important vulnerable groups are pregnant women and children under five. It has been shown that pregnant women attract twice the number of mosquitoes than women who are not pregnant³. Furthermore, there is a greater susceptibility to *P. falciparum* than *P. vivax* during pregnancy⁴. During pregnancy, malaria has a telling effect on the health of newborn children, for example, malaria is the leading cause of anaemia and low birth weight babies, and such babies are 2 to 4 times more likely to experience failure at school. Malaria affects cognitive development and learning abilities, and poses a risk factor for neurosensory and behavioural development of children⁵. One clinical febrile episode of malaria in terms of food value in adult uses approximately 5000 kcal or the equivalent of 2–3 days of food. The effect of this loss of energy is particularly reflected in the aforementioned vulnerable groups by high mortality due to lowering of immunity, already compromised by malaria and the current infection⁶. The return of malaria is impacting all aspects of human and national development. In this article I have attempted an analysis of the

existing malaria situation in India in populations living under extreme poverty.

The malaria scenario in India

With the advent of DDT and other residual insecticides in the 1950s, the National Malaria Eradication Programme (NMEP, now National Anti Malaria Programme NAMP) managed to effectively control malaria in three-fourth of India and was heading towards eradication. At the time of launching of the National Malaria Control Programme in 1953, estimated malaria incidence was 75 million cases and 0.8 million deaths. As a result of the eradication programme, malaria cases with reliable surveillance were reduced to 100,000 and deaths completely eliminated by 1965–66. Malaria was a rural disease. Towns in India had negligible malaria and its control was assumed to be carried by the local self-governments. This followed a period of reverses, malaria resurgence was seen widespread, and urban malaria, which was earlier insignificant, surged across the country. In urban areas, malaria is linked to a breakdown in municipal rules and regulations (particularly building codes), real estate expansion and lack of extension of health services into peri-urban areas. Urban poverty-related ill-health consists of STIs and now HIV/AIDS, pollution-related respiratory infections and violence. In 1971–72, NAMP implemented the Urban Malaria Scheme (UMS) in 131 towns with evidence of resurgent malaria. In contrast, malaria in rural India is linked to poverty and expressed through environmental degradation and lack of access to health services. Poverty-linked health issues in rural areas include lack of access to safe drinking water sources and sanitation, undernutrition, viral diseases like Japanese encephalitis and acute respiratory infections (due to indoor air pollution). Malaria in rural India continued to

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rise unabated, and in 1976, 6.47 million parasite-positive cases were recorded, the highest since its resurgence. In 1973, chloroquine-resistant strains were detected in Assam, with rising numbers of falciparum malaria cases. To tackle the deteriorating situation, NAMP implemented the Modified Plan of Operation (MPO) in 1977, with the aim to reduce malaria morbidity and mortality. Simultaneously, the *P. falciparum* Containment Programme (PfCP) was launched with financial assistance from the Swedish International Development Agency (SIDA).

Successful malaria control in the fifties and sixties got an impetus from the overall development of the country under the Five-Year plans. While the Green Revolution eradicated hunger and made the country self-reliant, industrial growth made the national economy vibrant and brought prosperity. Developments under the Five-Year plans had a positive effect on the health of the people of India. The attack on killer diseases was spectacular, e.g. eradication of smallpox, elimination of plague and cholera, and sharp decline in malaria incidence and deaths. Population below the poverty line started to diminish from 50% in 1970 to 26% in 2000.

Technical obstacles in malaria control such as insecticide resistance, pronounced exophilic vector behaviour, drug resistance in malarial parasites and financial problems in providing adequate resources to fight the disease characterize the return of malaria in India. Malaria deaths and epidemics that had been completely eliminated during the eradication phase returned. The main strategy of malaria control of indoor residual spraying (IRS) of insecticides produces transient transmission interruption, but any relaxation of field operations results in the return of malaria with more vigour and vengeance. In 2000 NAMP reported 2.02 million cases, 50% of which was caused by *P. falciparum*. Unfortunately, the incidence figures suffer from gross under-reporting and at best reflect the trend of the disease. In India, malaria often lies low and erupts as an epidemic that kills all age groups without distinction and therefore has an immediate destructive impact on the local economy. The full picture of the impact of malaria on the household and on the national economy remains obscure due to the lack of applied research to generate reliable information on the burden of malaria and the economic misfortune associated with it. Instead, what we have are the figures produced by NAMP through a fractured surveillance system, which are neither reliable nor useful in planning malaria control programmes in the country.

As a result of intensified malaria control under the MPO, the disease showed a downward trend, and cases were reduced from 6.47 million in 1976 to 3.06 million in 1979. Thereafter, malaria incidence fluctuated between 2 and 3 million cases annually. There was no further improvement in the situation in spite of new initiatives such as the global malaria control strategy, the revised malaria control strategy and the roll-back malaria initiative. Epi-

demiological investigations revealed that reduction in malaria incidence following the MPO was due to reduction in *P. vivax* and not *P. falciparum*. As a result, *P. falciparum* percentage continued to rise from 26% in 1965 to 50% in 2000. *P. falciparum* is a killer parasite. Emergence of resistance in *P. falciparum* to antimalarial drugs increases malaria morbidity, mortality and treatment cost. A progressive country like India, forging ahead to compete in the world in food production and industrialization, cannot afford to ignore the enormous human and material resources gulped by malaria.

Environmental degradation

Poverty is linked to malaria through environmental degradation. About half of India's land is affected by soil erosion. Irrigation is leading to desertification of once fertile land. Deforestation is taking a toll of 400 million people who depend on non-timber produce. Exploitation of coral reef and mangroves in the fragile island ecosystem is destroying their natural equilibrium. Central and state governments spend about US \$8000 million annually on poverty alleviation programmes. Instead of making the rural economy vibrant and self-reliant, this financial injection has created economic dependency among a generation of daily-wage workers at the cost of once sustainable village economy. The Planning Commission of India has classified 100 districts as poor—which occupies one-fourth of the country's geographical area. Loss of sustainable village economy breeds poverty and an unsustainable environment.

Poverty and malaria receptivity are the two interwoven determinants of malaria that have not been addressed in our approach to malaria control. Return of malaria and its refractory nature is a serious consequence of this neglect. Excessive reliance on insecticides and drugs has resulted in drug-resistant malaria transmitted by resistant and refractory vectors. The future road map of malaria control still relies on eradication strategy. Vast areas of the country are poorly served by the primary health care system, and the private sector remains the backbone of health management in the country. Malaria is predominantly the disease of the poor. The real poor cannot afford private treatment and therefore must resort to self-medication, usually with traditional medicine, at their own peril. Malaria treatment may cost US \$3 to 10 and complicated malaria US \$300 to 600. This cost is to be seen in the context of poverty in South Asia. Environmental degradation *inter alia* is damaging our fauna, flora, land and water bodies, sustainable ecology and creating havens for the disease vectors. In addition to malaria, the last 4–5 decades have seen the unstoppable march of Japanese encephalitis and dengue haemorrhagic fever (DHF). National development projects aimed at poverty alleviation lack proper health-impact assessments

Table 1. Relationship of poverty with malaria in the Indian states below poverty line in 1999–2000

Year	Percentage NAMP population in current BPL states at risk of malaria	Total malaria cases in India	Total malaria cases in BPL states	Percentage malaria cases in BPL states	Total <i>P. vivax</i> cases in India	Percentage <i>P. vivax</i> cases in BPL states	Total <i>P. falciparum</i> cases in India	Percentage <i>P. falciparum</i> in BPL states
1965	28.99	99,667	29,576	29.67	73,504	29.24	26,163	30.89
1970	50.35	694,017	199,743	28.78	593,902	26.08	100,115	44.98
1975	50.01	5,166,142	1,843,681	35.68	4,436,891	29.70	729,251	72.09
1980	49.82	2,898,140	1,055,750	36.42	2,310,129	26.47	588,011	75.51
1985	49.86	1,864,380	940,788	50.46	1,319,375	39.11	545,005	77.94
1990	50.15	2,018,783	804,148	39.83	1,266,665	27.40	752,118	60.75
1995	48.47	2,296,008	1,465,078	50.06	1,503,877	37.25	792,131	70.24
2000	52.59	2,019,065	1,404,737	69.57	971,149	49.28	1,047,916	88.37

Poverty line came down from 55% in 1973–74 to 36% in 1993–94. However, the poor people remained stable at around 320 million till 1993. In 1999–2000, national average of population BPL was 26.1% (about 260 million). States with percentage of population BPL in 1999–2000 were: Arunachal Pradesh (33.47), Assam (36.09), Bihar + Jharkhand (42.60), Madhya Pradesh (MP) + Chattisgarh (37.43), Manipur (28.54), Meghalaya (33.87), Nagaland (32.67), Orissa (47.15), Sikkim (36.55), Tripura (34.44), Uttar Pradesh (UP) + Uttaranchal (31.15), and West Bengal (27.02). It may be noted that Bihar, UP and MP have been divided to carve out three new states.

Source: Planning Commission, 1999–2000 and the National Anti-Malaria Programme, Government of India.

and incorporation of health safeguards; thus these projects have been continually adding to the misery of the poorest of the poor.

Poverty and malaria

According to a report of the Planning Commission, 26.10% of India's population lives below poverty line (BPL) defined as the income per month in 1999–2000—rural Rs 327.56 or US \$6.68 and urban Rs 454.11 or US \$9.26. The number of poor people is 254 million (rural 27.09% and urban 23.62%). We have examined the malaria incidence figures in the context of the population BPL. Poverty in India is highly pronounced in the malarious belts of the country. Table 1 gives malaria incidence figures since 1965 of the BPL states in 1999–2000. It may be noted that twelve states in India have more than 26.1% population BPL. An estimated 50–52% population lives in these states. This population contributes 70% total malaria cases (50% *P. vivax* and 88% *P. falciparum* cases). In 1965, when average poverty in India was >50%, malaria cases in the BPL states (1999–2000) were 30% (*P. vivax* and *P. falciparum* were also 30% each). The green revolution and industrial growth of the country resulted in poverty alleviation and general improvement in living standards. Population BPL declined to about half by 2000. In states with greater than 26.1% population still BPL, malaria remained deeply entrenched and did not respond to the interventions. The real malaria situation in states BPL is appalling. For example, in the three highly populated states of India, namely Bihar, Uttar Pradesh (UP) and West Bengal; the population BPL is 42.6, 31.15 and 27.02% respectively. The annual

blood examination rate (percentage of slides of fever cases examined to detect malaria) in 2000 was 1.24 in Bihar, 1.36 in UP and 3.62 in West Bengal, instead of 10, which is the minimum required for detection of malaria. Together these states account for a population of 363 million, i.e. one-third of India's population with dismal surveillance. A study on the relationship between poverty and malaria revealed that the malaria scenario in the last three decades shows a clear divergence, i.e. declining trend of malaria in well-performing states and a reverse situation in states whose economy continued to be stagnant. Thus malaria was linked with poverty, and poverty with environmental degradation. Improvement in the prevailing malaria situation requires a determined effort at the highest level of governance to make a difference. Key to malaria control lies in understanding local malaria with a primary attack on poverty and malaria receptivity.

1. *Rice: Hunger and Hope?* IRRI, Manila, Philippines, 1998–99.
2. UNICEF, The state of world children 2002, United National Children's Fund Report, 2002.
3. Lindsay, S., *Lancet*, 2000, **355**, 1972.
4. Espinosa, F. M., *Lancet*, 2000, **356**, 685.
5. Sachs, J. and Malaney Pia, *Nature*, 2002, **415**, 680–685.
6. Howard, M. L., Key problems impeding modernization of developing countries, US Agency for International Development (Health Issues), Washington, USA, 1970.

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