Tribal Malaria, an Update on Changing Epidemiology

Neeru Singh

Abstract

Madhya Pradesh which accounts for 6% of total population of the country contributing highest number of malaria cases (>20%) up to 1997. In 1997 Enhanced Malaria Control Programme (EMCP) was launched by National Vector Borne Disease Control Programme (NVBDCP) with World Bank assistance to control tribal malaria. Consequently, 20 districts having >25% tribal populations in state have been brought under EMCP. Despite World Bank initiative during 2003 several focal outbreaks swept across the state between 2003 to 2006. Therefore, the changing epidemiology of malaria in Madhya Pradesh was studied by retrospective analysis of data on malaria morbidity and mortality reported under the state health (unpublished NVBDCP data) from 1997 to 2006 to define trends.

From 1998 onwards, though the number of malaria infections and *P. falciparum* declined (77% and 69% respectively) as a result of intensive intervention measures in districts under EMCP, malaria cases started increasing (upto 50%) in areas which are not under EMCP and where malaria was never a problem. The number of deaths also showed an alarming increase. The comeback of malaria was largely due to complete cessation of vector control activities and deterioration of health services. We conclude that more diversified control measures are needed for sustainable malaria control.

Introduction

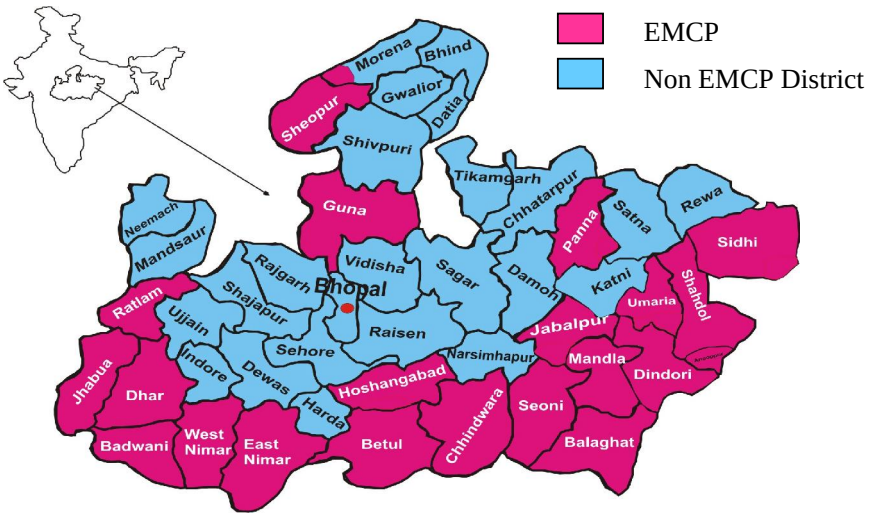
Central India (Madhya Pradesh) is situated in the central part of India (longitude 80.00^{0}E and latitude 23.30N) with an area of 305.3 thousand km^2 of which forest covers 95,221 km^2 (about 31% of the total land area). This is a rural agricultural state marked by severe poverty and under development. In Madhya Pradesh malaria is complex because of vast tracts of forest with tribal settlement. According to an estimate made in 1987, 54 million tribals of various ethnic origins residing in forested areas and accounting for 8% of the total population contributed 30% of total malaria cases, 60% of total falciparum cases and 50% of malaria deaths in the country (Sharma, 1996). In view of this, a new malaria control strategy “Enhanced Malaria Control Project (EMCP) or Tribal Malaria action Plan was introduced in 1997 by the National Anti Malaria Programme (now named as National Vector Borne Disease Control Programme, NVBDCP) in seven North Eastern states and tribal area of peninsular states of India with World Bank assistance (Dhingra *et al*., 1997). The EMCP project directly benefited the 62 crore tribal population of the seven peninsular states. However, the population living in other malaria endemic areas was also benefited as the strengthening of the component of information, education and communication (IEC), training and management information system covered the entire country. The project is to cover the most problematic areas and has the flexibility to divert resources to any needy areas in case of any outbreak of malaria (Dhingra *et al*., 1997). We carried out a retrospective analysis of data on malaria morbidity and associated mortality reported under the existing surveillance system of the state for the year 1998 to 2006 to define the epidemiological trends. A review of malaria in MP is also instructive to evaluate the impact of antimalarial measures. This documentation

will serve as an information and resource tool for decision makers in ministries of health in other public and privates sectors in designing effective control strategies.

The area, population and terrain

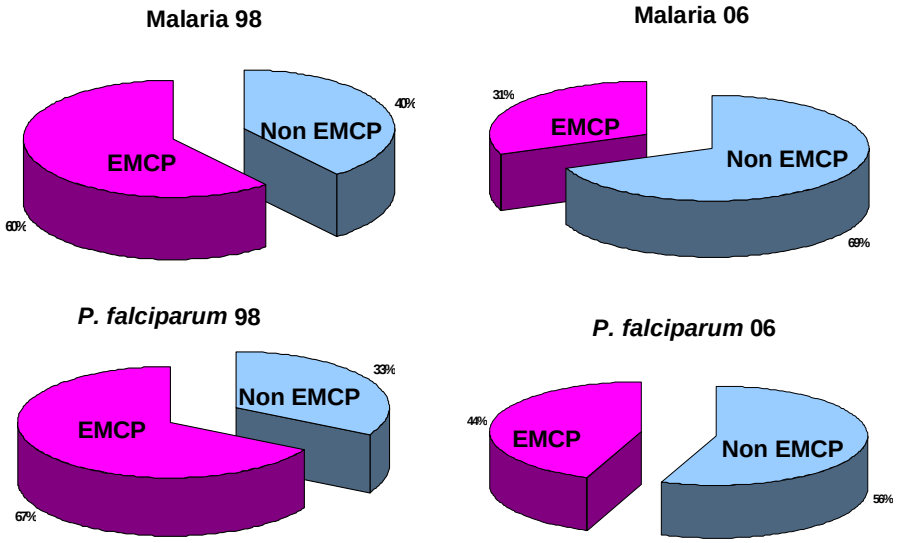
There are 48 districts (Population 68.60 million) in the state (Fig. 1), however, only 20 (14.40 million) are under the World Bank assisted EMCP (Anon 2002-03), which contribute 60% malaria and >65% *P. falciparum* and death in the state (Fig. 2).

Fig. 1: Map showing EMCP & NON EMCP Districts



Source: State Health, Bhopal

Fig. 2: Malaria/ *P.falciparum* cases in EMCP districts vs. non EMCP district



The ethnic tribe mainly Gond is living with other backward classes and non tribals in scattered primitive houses in field and forest. They are illiterate and poorly clothed and have immense faith in sorcery and witch-craft. Villages are located in the deep forest and are characterized by rocky undulations interspersed with ravines and foothills. During rainy season, the region is highly prone to water logging. There are innumerable streams which flow into the river. Narmada, is the main river of MP and traverses through this state. The streams are prone to frequent floods which disrupt communication for several months in all anterior villages. Flood water sometimes enters the houses. Streams and their associated bed pools are the perennial source of breeding. The stream flow continues into the autumnal months and stagnant water remains in smaller tributaries which produce an enormous number of anophelines particularly *Anopheles culicifacies* throughout the year. The dense forest provides shelter and humidity. As the population density is low and the breeding sites are very extensive, the ratio of the breeding sites to man is very high. Breeding sites are covered with dense aquatic vegetation which makes it difficult to employ any control agent. Patches of swamps and seepages exist all along the streams and tributaries.

The climate of the region is characterized by a hot summer (March-June), Monsoon /rainy season (July-October) and a cool/ autumn season (November-February). The temperature varies from 48^{0}C in summer to 3-9^{0}C in winter. Almost all the rain falls in a single rainy season between June to October (600-2000 mm) (Anon 2002-03, State Health Bhopal Annual Action Plan, 2002-03).

Malaria is transmitted by two efficient vectors i.e. *Anopheles culicifacies* and *An. fluviatilis*. The density of An. culicifacies is very high throughout the year. *An.culicifacies* is mainly endophilic but in dense forest it is equally exophilic (Singh *et al*., 1996) while *An. fluviatilis* is mainly exophilic. Malaria control is mainly based on two tools i.e. vector control by indoor residual spray, two rounds of DDT annually (1 gm/m^2) and chemotherapy using chloroquine (CQ) for treatment. Under EMCP emphasis was placed on early diagnosis and prompt treatment (EDPT) by hiring village health link workers. Reliance in vector control from total dependence on insecticide is shifted to integrated control approach depending on local situation, adequate supply and timely replenishment of drugs, limited rapid diagnostic test for EDPT and IEC.

For analysis of epidemiological trends, secondary data pertaining to Annual Parasite Incidence (API) were relied on. Estimates were based on data pooled over all 12 months a year from all the districts from 1998-2006. These estimates were based primarily on active case detection (where a malaria worker goes into a community and takes blood smears from suspected malaria cases) with minor contribution from passive case detection (where blood smears were made from suspected malaria cases among patients visiting a health centre or a hospital). These data were compiled at the state head quarters as reported by the respective District Malaria Officers.

Data Analysis

Annual Parasite Incidence (API): The annual number of smear positive cases/1000 subject. Annual Blood Examination Rate (ABER): The annual number of fever cases providing blood samples for examination.

Slide Positivity Rate (SPR): The proportion of examined thick smear found parasite positive and the related slide falciparum rate (SFR).

P.falciparum percentage (Pf%): The proportion of *P.falciparum* found in parasite positive blood smear. Data was entered in Visual FoxPro 6.0 for Windows using SPSS for Windows 11.5 for various analysis.

Situation Analysis

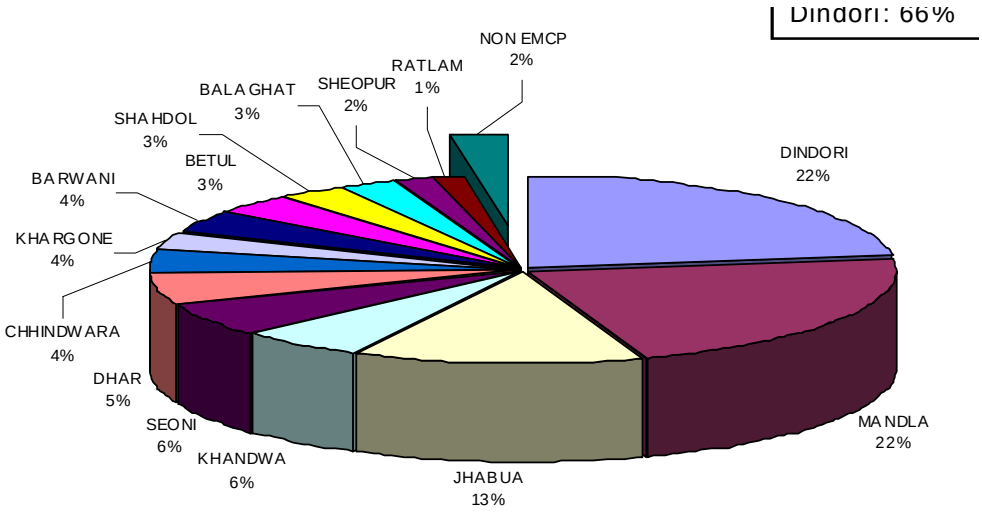
In MP, there are some districts where the problem of malaria is worsening year by year particularly the hardcore tribal districts having around 50% tribal population i.e. Mandla, Dindori, Jhabua (Fig. 3). These three districts contributed 57% of state's malaria and 60% *P.falciparum* infection while their population is only about 4.99% of the state population. Similarly Betul (Pop. 1.4 million) was accounted for 10% of all malaria cases in MP while it harbored less than 1% of the state population (Anon. 2000). The EMCP was initially launched in 18 districts in MP in 1997 and gradually extended to 20 districts in 2004. Consequently, a gradual decline in malaria prevalence rate was recorded from 1998 onwards (Table 1). The lowest incidence was found in 2002, when overall 64 and 61% reduction was recorded in malaria and *P. falciparum* respectively. Later on this tempo could not be maintained and malaria and *P. falciparum* started increasing in the 2003 (11 and 22%) and in 2004 (50 and 106% respectively) followed by a marginal decline in 2005 (19 and 9%) and in 2006 (36 and 21%) respectively in number of malaria and *P.falciparum* cases (Fig. 4).

Table 1: Showing malaria situation in EMCP Vs non EMCP district

Districts under EMCP/ Non-EMCP	Indices	1998	1999	2000	2001	2002	2003	2004	2005	2006
Non EMCP	BSE	4950924	5114826	5750984	5962774	5913071	6130675	6024210	5973584	6570917
	Positive	85513	83800	81643	76118	44186	55342	57334	66559	66090
	P.falciparum	20404	17277	19327	19071	9165	14883	14004	17595	16215
	P.vivax	65109	66523	62316	57047	35021	40459	43330	48964	49875
	SPR	1.73	1.64	1.42	1.28	0.75	0.90	0.95	1.11	1.01
	SFR	0.41	0.34	0.34	0.32	0.15	0.24	0.23	0.29	0.25
	SVR	1.32	1.30	1.08	0.96	0.59	0.66	0.72	0.82	0.76
	PF%	23.86	20.62	23.67	25.05	20.74	26.89	24.43	26.44	24.53
	ABER	12.45	12.55	13.04	12.73	12.19	12.33	12.18	12.49	13.41
	API	2.15	2.06	1.85	1.63	0.91	1.11	1.16	1.39	1.35
EMCP	BSE	2601510	2750417	2605479	2956845	3003718	3258615	3253735	2998131	3164981
	Positive	130614	119449	76505	72229	46869	52149	70472	37758	30040
	P.falciparum	41295	39155	29401	28660	16079	19691	33060	14628	12777
	P.vivax	89319	80294	47104	43569	30790	32458	37412	23130	17263
	SPR	5.02	4.34	2.94	2.44	1.56	1.60	2.17	1.26	0.95
	SFR	1.59	1.42	1.13	0.97	0.54	0.60	1.02	0.49	0.40
	SVR	3.43	2.92	1.81	1.47	1.03	1.00	1.15	0.77	0.55
	PF%	31.62	32.78	38.43	39.68	34.31	37.76	46.91	38.74	42.53
	ABER	14.51	14.97	14.82	15.26	15.13	16.13	15.92	15.55	16.01
	API	7.29	6.50	4.35	3.73	2.36	2.58	3.45	1.96	1.52

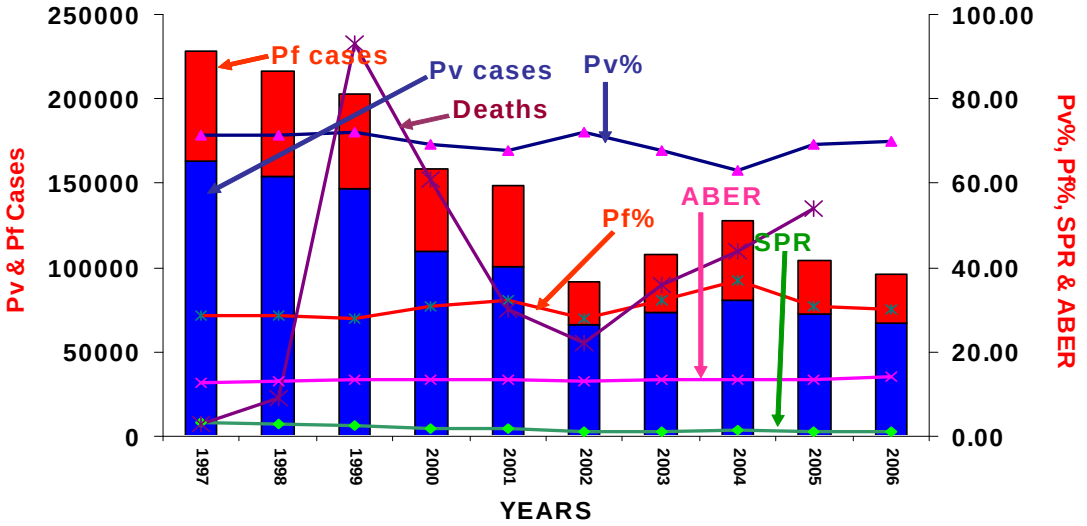
Source: State Health, Bhopal

Fig. 3: Relative contribution of district wise malaria in the state



Source: State Health, Bhopal

Fig. 4: Malaria Profile of Madhya Pradesh (1997-2006)



			Conf.	Sus					
MCP	2	7	92	61	57	26	17	34	3
on-EMCP	1	2	1	6	4	4	5	2	
otal	3	9	93	67	61	30	22	36	4

urce: State Health, Bhopal

For districts which are not under EMCP, there was also declining trend in malaria and *P. falciparum* infections from 1998 onwards (2 to 48% respe wever, the complete cessation of vector control activities and the neglect veillance for a long time in many non tribal areas are responsible for malaria res ring 2003 malaria returned and several focal outbreaks swept across the tween 2003 to 2006 increasing malaria cases from 25% to 50% (Fig. 5). eated new foci of transmission and the incidence of malaria has increas .6%. The number of death increased from 1 to 13 in 2006 (13 folds). Howe portion of *P. falciparum* has held steady with no further increase from 1998

ılaria and is becoming more severe as a consequence of the increasing inci
alciparum infection (Singh *et al*., 2006a). Malaria today is totally differe
ılaria in the past. The disease has great variation and its dynamics vary. The
ological imbalances created by human activities heavily affected the
nsmission. Epidemics are a permanent threat in the state and can lead t
thology and deaths in all age groups. The PHC responsible for providing health
the villages was often understaffed and can hardly cope with the high preva
ılaria and practically focusing on short term emergency type curative medicine.
easuring mortality from malaria is difficult because in villages there is no sy
ıtine death certification. Only in district hospital, where a limited numbe
ojects come for treatment can give a reasonably accurate indication of the
rtality. The problem is further compounded by poor infrastructure making it
seriously ill patients to access government facilities (Singh *et al*., 2006). T
telephone services in the majority of the government maintained health cer
pensaries within the PHC/Block or ambulances to take patients to a better e
spital if necessary. Thus the inference is that the number of malaria infect
ociated deaths could indeed be much higher than reported herein due to

on. 1997-2006. State wise malaria situation during 1997-2006. National Vect
sease Control Programme. 22-Sham Nath Marg Delhi 110054.

on. 2000. District wise epidemiological situation in Madhya Pradesh. Direc
alth Services, Madhya Pradesh, Bhopal.

on. 2002-03. State Health Bhopal. Annual Action Plan.

ingra N, Joshi RD, Dhillon GPS, Lal S.1997. Enhanced Malaria Control Project f
nk support under National Malaria Eradication Programme (NMEP). J.Comm.
. pp201-208.

:tanayak S, Sharma VP, Kalra NL, Orlov VS., Sharma RS. 1994. Malaria Para
lia and control strategies. Indian J.Malariol. Vol.31.pp141.

arma VP. 1996. Re-emergence of malaria in India. Indian J.Med.Res. Vol.103.p

arma VP. 2006. Scientific correspondence Current Science (in Press).