

# Control, Eradication and Resurgence of Malaria in Kerala during the past 50 years

K Sandeep

Health Services Department, DHS Office, Trivandrum.\*

## ABSTRACT

Published on 30<sup>th</sup> December 2008

Malaria is an important health problem in many parts of Asia, South America and Africa. Malaria is not eradicated from Kerala even after implementation of various malaria control strategies.

**Objective:** Incidence of malaria in Kerala during the last 50 years and also the effectiveness of various malaria control programmes during the same period investigated.

**Methodology:** Secondary data on malaria were collected from the various health reports and registers. Malaria was eradicated from Kerala in 1965. However malaria returned to Kerala after few years and continued to spread. Resurgence of malaria was due to many reasons, which include interstate and international travel, inadequate environmental sanitation, import of cases and mosquitoes from other states, migration of increased number of laborers from other states, absence of organized preventive public health system in urban areas, urbanization and inadequate field work.

**Result:** Active and passive surveillance form important components in malaria eradication and control programmes. Case detection rate in active surveillance was less than 0.2 % and in mass and contact survey it was less than 0.05%.

**Keywords:** Malaria, Control programmes, Plasmodium, Mosquito

\*See End Note for complete author details

Number of malaria cases and deaths have increased over the past few decades. About 3.2 billion people, more than half the world's population, are at risk of infection. Globally there are between 350 million and 500 million clinical cases each year resulting in 1 million deaths.<sup>1</sup> Although malaria remains an important health problem in some parts of Asia and South America, its main impact is in sub-Saharan Africa where at least 90% of deaths from malaria occur.

The principal vectors, which cause malaria in most parts of India, are the *Anopheles culicifacies* in rural areas, *An. stephensi* in urban areas and *An. fluviatilis* in hilly-forested areas. Presently malaria is endemic in the central, south eastern and north eastern parts of the country. However in the year 1998, about 20,000 people and an estimated 577,000 DALYs (disability-adjusted life years) were lost due to malaria in India.<sup>2</sup>

## MATERIALS AND METHODS

Secondary data on malaria was collected from the various reports and registers of Directorate of Health Services and Directorate of Medical Education from 1956 to 2006. The information was also collected

from libraries and internet. The data collected from the reports were cross checked with published survey reports and books. The collected data was entered in excel and analyzed using standard statistical methods.

## RESULTS

### National Malaria Control Programme 1953-1958

National Malaria control programmes was launched in April 1953 and main activity was indoor residual spraying with DDT twice a year in endemic areas.<sup>1</sup> First control unit was established in 1953 at Trivandrum and second unit in 1955 at Thrissur.<sup>2</sup> One more control unit was established in Malabar area later. More over there were special schemes for highly endemic areas like Malampuzha, Nilambur and Wayanad. There were about 9 hypoendemic units and 3.5 hyperendemic units under malaria control units. In hypoendemic areas malaria transmission is low and malaria is not an important problem. However in hyperendemic areas transmission is intense, but seasonal.

DDT has been used extensively for spraying houses and other structures during this period. BHC was also

### Corresponding Author:

Dr. K Sandeep, MPH, Assistant Surgeon, Health Services Department, DHS Office, Trivandrum.  
E-mail: sandeepkerala@hotmail.com

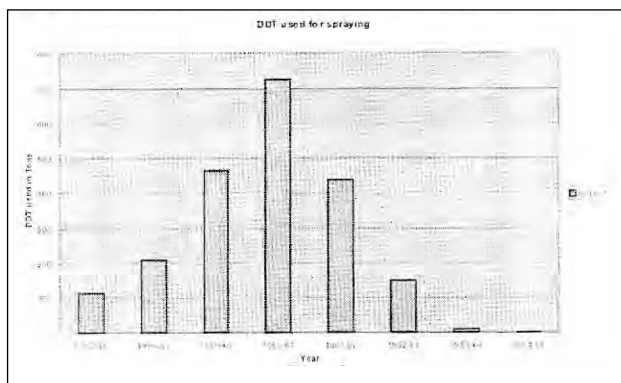


Figure 1. Amount of DDT used for spraying in the initial phase of the programme

used for spraying to a lesser extends. Total number of structures/ houses sprayed was 5 lakh in 1958-59 and increased to 45 lakhs in 1961-62. In Kerala, malaria cases decreased from 46216 cases in 1955 to 7481 cases in 1958. At the national level malaria cases declined from 75 million cases in 1953 to 2 million cases in 1958.

### National Malaria Eradication Programme 1958-1977

In 1958 Government of India changed the strategy from control to eradication and launched National Malaria Eradication Programme. The malaria eradication programme was very successful in the initial phase and total number of malaria cases fell to 50,000 in 1961.

Simultaneously the eradication programme was

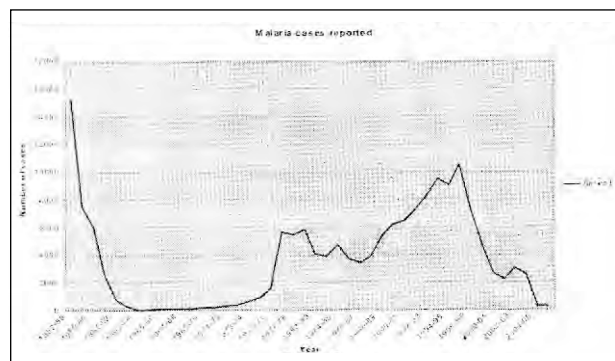


Figure 2. Trend of malaria during the Last 50 years

launched in all districts of Kerala. One separate Malaria laboratory was started in 1958 for each of the 9 hypo Endemic units apart, from central laboratory. In 1960 two more hypo endemic malaria units were started in Kuttipuram and Ambalapuzha. The total area of Kerala was divided into North and South zones. State has been divided into 333 divisions, which consist of 4-5 sections for the effective implementation of the programme. In 1963 regular DDT spraying was discontinued in the state. There was successful termination of Malaria Eradication programme in Kerala in 13.5 malaria units out of 14.5 units. In 1965, Kerala was declared as first state in India which eradicated malaria. This successful completion of Malaria Eradication has been judged by absence of indigenous cases for last two years from the entire area of the state. The state entered in the maintenance phase of the programme and regular

Year	Active surveillance		Mass Survey		Passive Surveillance		Total Number of slide positive Malaria
	No of slides examined	Slides positive for Malaria	No. of slides examined	Slides positive for Malaria	No. of slides examined	Slides positive for Malaria	
		Number %		Number %		Number %	
1983-84	467563	596 0.13	240145	18 0.007	93250	3230 3.46	3844
1984-85	451735	768 0.17	244215	42 0.017	95604	3859 4.04	4669
1985-86	350583	427 0.12	161964	31 0.019	112518	3285 2.92	3743
1986-87	497100	435 0.09	182778	31 0.017	222651	2971 1.33	3437
1987-88	587780	485 0.08	225159	24 0.011	360043	3420 0.95	3929
1988-89	706437	732 0.10	314371	20 0.006	476001	4595 0.97	5347
1989-90	745372	678 0.09	343454	22 0.006	529600	5494 1.04	6194
1990-91	781354	659 0.08	311860	22 0.007	558962	5824 1.04	6505
1991-92	748192	600 0.08	267632	14 0.005	510612	6553 1.28	7167
1992-93	642860	517 0.08	211385	18 0.009	461126	7703 1.67	8238
1993-94	576961	607 0.11	207310	6 0.003	414014	8848 2.14	9461
1994-95	518817	414 0.08	183635	93 0.051	405350	8865 2.19	9372
1996-97	624935	801 0.13	252299	24 0.010	488079	9681 1.98	10506
1999-00	862007	313 0.04	199668	9 0.005	533855	4351 0.82	4673
2000-01	891074	150 0.02	134590	7 0.005	582393	2573 0.44	2730
2001-02	926051	137 0.01	118708	8 0.007	526942	2081 0.39	2226

indoor residual spraying was discontinued except at Sabarigiri Hydro project. Seasonal DDT spraying continued in all project areas in 1966. No indigenous cases were detected until 1968, however 14 indigenous cases were detected on 1969.

### Modified Plan of Operation 1977

Modified plan of operation started in Kerala on 1<sup>st</sup> April 1977 in line with rest of India. This change in strategy was due to resurgence of malaria in most part of India in spite of active mosquito control measures during the eradication programme. As Annual Parasite Index (API) in Kerala was less than 2 and no indigenous Plasmodium falciparum infections were reported from Kerala, regular spraying and focal spraying were discontinued in State. However from December 1977 onwards focal spraying started in the state irrespective of API status, considering the special epidemiological situation. A new component, P. falciparum containment, has been introduced in October 1977 for the prevention and containment of falciparum malaria.

### Malaria Action Plan 1994

Malaria action programme was introduced in 1994 as per the recommendation of “expert committee on malaria” for prediction, early detection and effective response to malaria outbreak at district level.

The An. stephensi species which was not present in Kerala during the past, entered the state in nineteen nineties and contributed to the malaria outbreak during 1996 at Valiathura near Thiruvananthapuram airport, where over 100 cases of malaria were reported. This was followed by another outbreak in Kasargod during 1998 when 405 cases and three deaths were reported.<sup>1</sup> New programme and strategies were not able to prevent the new epidemic in Kerala.

## DISCUSSION

Malaria in Kerala showed a cyclical trend with peak in 20 years. The incidence was higher before 1957, before the formation of Kerala state, and with the control measures indigenous cases reduced to zero in 1965. Malaria reemerged and reached 5782 cases in 1978 and then showed a downward trend for some years. Second peak occurred about 20 years later, in 1996, with 10506 cases and there after showed a continuous downward trend.

Active and passive surveillance form important components in malaria eradication and control

Year	No. of Malaria positive cases	Pl vivax infection	Percentage of cases infected with P. vivax	P falciparum infection	Percentage of cases infected with P falciparum
1982-83	4052	4012	99.01	40	0.99
1983-84	3844	3766	97.97	78	2.03
1984-85	4669	4619	98.93	50	1.07
1985-86	3743	3689	98.56	54	1.44
1986-87	3437	3326	96.77	111	3.23
1987-88	3929	3832	97.53	97	2.47
1988-89	5347	5188	97.03	159	2.97
1989-90	6194	5935	95.82	259	4.18
1990-91	6505	6285	96.62	220	3.38
1991-92	7167	6874	95.91	293	4.09
1992-93	8238	7858	95.39	380	4.61
1993-94	9461	8976	94.87	485	5.13
1994-95	9072	8576	94.53	496	5.47
1996-97	10506	9671	92.05	835	7.95
1998-99	7251	6283	86.65	968	13.35
1999-00	4673	4153	88.49	538	11.51
2000-01	2730	2208	80.88	523	19.16
2001-02	2226	1836	82.48	313	14.06
2002-03	3089	2707	87.63	382	12.37
2003-04	2572	2070	80.48	502	19.52
2004-05	291	257	88.32	34	11.68
2005-06	265	231	87.17	34	12.83

programmes. Case detection rate in active surveillance was less than 0.2% and in mass and contact survey it was less than 0.05%. The relevance of active surveillance and mass survey is doubtful in the context of low detection rate. However in the passive surveillance the case detection rate was higher, which is more relevant. To establish effective control, a rigorous assessment of the geographical distribution of the disease is also needed.<sup>1</sup> This can be achieved by vector survey and geographical mapping of the vector prevalence. Absences of such reports are largely due to inadequate documentation and publication of data rather than collection of such data.

The preventive health care systems in urban areas are weak, which can be explained by the absence of organized primary health care setup in urban areas. Similarly due to absence of malaria control programme in urban areas urban areas are at a high risk for malaria epidemics.<sup>2</sup>

Control measures usually depend on routine services being instituted and maintained in a long term perspective, contrast to the eradication where activities

are time limited, intensive targeted and organized in a circumscribed programme.<sup>3</sup> Malaria eradication plan later changed to modified action plan, which focus on control of the malaria rather than eradication.

First global strategy for the malaria eradication was massive application of Dichlorodiphenyltrichloroethane (DDT) to interrupt transmission of the disease in countries around the world. This approach failed to interrupt transmission completely in many countries and malaria resurged.<sup>4</sup> Moreover, vector control measures using insecticides become ineffective because of the resistance of Anopheles mosquitoes to insecticides and treatment of Plasmodium falciparum malaria become more difficult as parasites become drug resistant.<sup>5</sup> Moreover no vaccine is commercially available against malaria as malaria parasites are more complex than disease causing viruses and bacteria.<sup>6</sup> It is less chance to develop an effective vaccine against Malaria in the near future. Life cycle of plasmodium is complex, which encompasses several stages in mosquito and humans. A vaccine effective in killing one stage may not inhibit the growth of another. However conventional control measure like source reduction, anti larval measures and personal protection are effective. Malaria was eliminated from the United States and from most of Europe during the first half of the twentieth century as a result of changes in land use, agricultural practices and house construction and targeted vector control.<sup>7</sup>

The causes of resurgence of malaria in Kerala are rather complex and includes interstate and international travel, inadequate environmental sanitation, import of cases and mosquitoes from other states, migration of increased number of laborers from other states, absence of organized preventive public health system in urban areas, urbanization and inadequate field work. Lack of flexibility and regional level planning in the malaria control programme adversely affected the implementation at peripheral level.

## CONCLUSION

Highly developed levels of sanitation and health systems development may make elimination of a disease feasible in one geographical area but not in another. Secondary transmission from imported cases will continue to occur even after elimination has been achieved.<sup>8</sup> This is due to interstate and international travel and also rarely due to import of infected mosquitoes from other endemic regions.

Eradication of many diseases like malaria was unsuccessful during the past. However they contributed greatly to a better understanding of the biological, social, political and economical complexities of achieving the ultimate goal in the disease control.<sup>9</sup> More over all malaria eradication programme is able to control the transmission to a great extent and eliminate the disease from many parts of the state temporally. Integrated mosquito control measures not only eliminate malaria from the state but also control of other mosquito born diseases like Dengue fever, Chikungunia and Filariasis.

## END NOTE

### Author Information

Dr K Sandeep, MPH, Assistant Surgeon, Health Services Department, DHS Office, Trivandrum. E-mail: sandeepkerala@hotmail.com

**Conflict of Interest:** None declared

**Cite this article as:** K Sandeep. Control, Eradication and Resurgence of Malaria in Kerala during the past 50 years. Kerala Medical Journal. 2008 Dec 30;1(2):41-44

## REFERENCES

1. Is malaria eradication possible? Lancet. 2007 Oct 27;370(9597):1459.
2. Bhattacharya S, Sharma C, Dhiman R C, Mitra A P. Climate change and malaria in India. Current Science 2006; 90, No 3: 369-375.
3. Vina yachandran P. Kerala medical history<sup>7</sup>. Kottayam, India. Current hooks 2001.
4. Gosling RD, Drakeley CJ, Chandramohan D. Effective malaria control: better burden estimates needed. Lancet. 2008 Mar 1;371(9614):724.
5. Thankappan K R, Yesudasan C A K, Sarma P S, Philip O, Ramachandran P, Joseph A. Independent review of national vector born disease control programme. Trivandrum. Sree Chira Tirunal Institute for Medical Science and Technology 2004.
6. Melgaard B, Creese A, Aylward B, Olive J M, Maher C, O'cwo-Bele JM, Lee JW. Disease eradication and health systems development. Bulletin of WHO 1998;76 (suppl 2):26-31.
7. Feachem R, Sabot O. A new global malaria eradication strategy. Lancet. 2008 May 10;371(9624):1633-5.
8. Levine MM, Levine OS. Influence of disease burden, public perception, and other factors on new vaccine development, implementation, and continued use. Lancet. 1997 Nov 8;350(9088):1386-92.
9. Dunavan C P. Tacking malaria. Scientific American India Dec 2005:33-39.
10. Greenwood B, Mutabingwa T. Malaria in 2002. Nature. 2002 Feb 7;415(6872):670-2.
11. De Serres G, Gay NJ, Farrington CP. Epidemiology of transmissible diseases after elimination. Am J Epidemiol. 2000 Jun 1;151(11):1039-48; discussion 1049-52.
12. Dowdle WR. The principles of disease elimination and eradication. Bull World Health Organ. 1998;76(Suppl 2):22-5.