Situational Analysis of Malaria

in

District Tumkur, Karnataka,

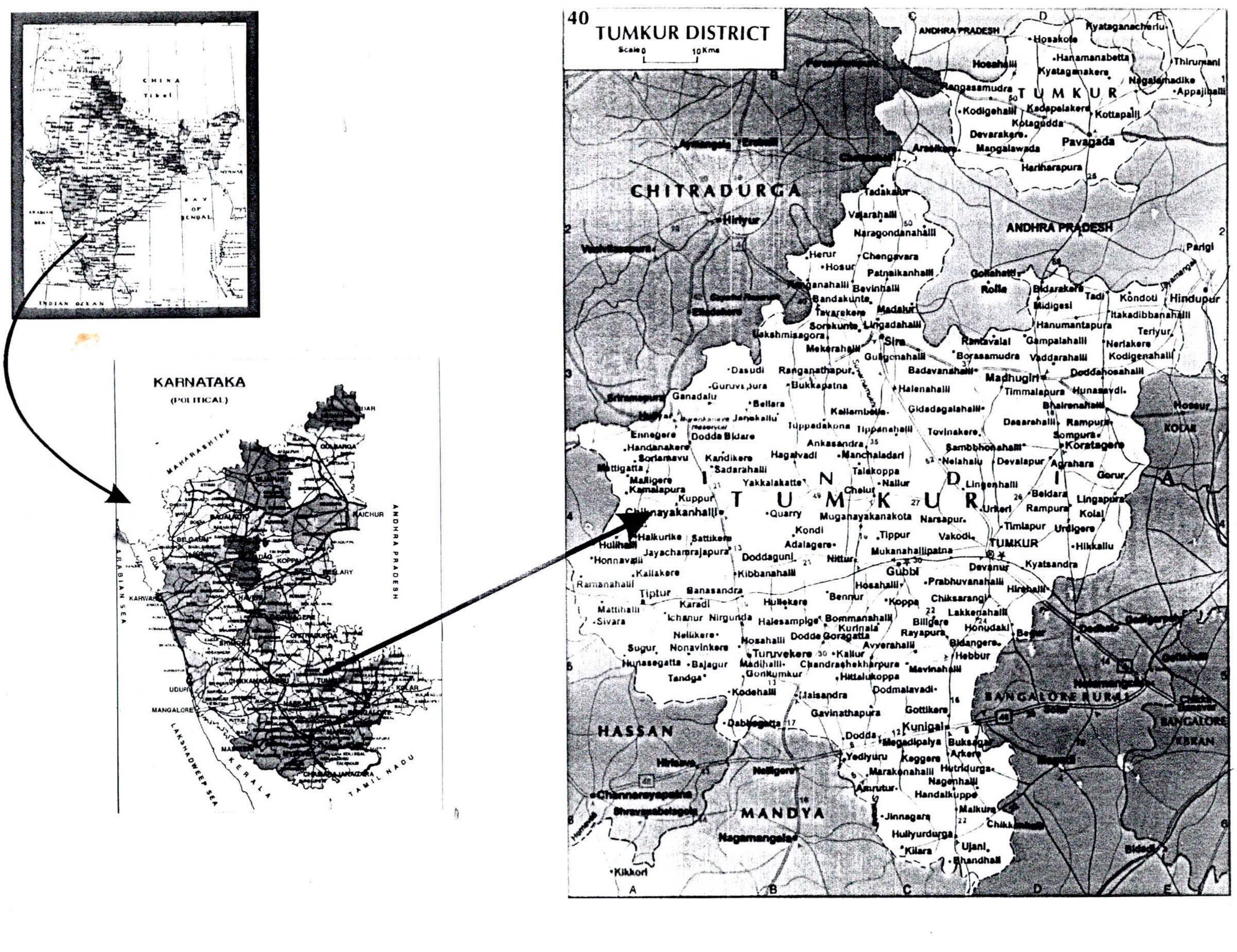
under

Roll Back Malaria Initiative

Malaria Research Centre

(Indian Council of Medical Research)

22, Sham Nath Marg, Delhi-11005



CHINA
Tibet
BAY OF BENGAL
ARABIAN SEA
INDIAN OCEAN
KARNATAKA
(POLITICAL)
MAHARASHTRA
ANDHRA PRADESH
ARABIAN SEA
LAKSHADWEEP SEA
KERALA
TAMIL NADU
GOA
RAICHUR
BELLARY
UDUPI
MANGALORE
40
TUMKUR DISTRICT
Scale 0 10 Kms
CHITRADURGA
ANDHRA PRADESH
TUMKUR
HASSAN
MANDYA
BANGALORE RURAL
BANGALORE
KOLAR
Pavagada
Hiriyur
Sira
Madhugiri
Koratagere
Tiptur
Chiknayakanhalli
Gubbi
TUMKUR
Turuvekere
Kunigal
Hindupur
Parigi

Team Members

Field Survey

1. November 5-17, 2000

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2. August 26 to September 16, 2001

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Executive Summary

Tumkur is one of the highly malarious district of Karnataka state reporting over 15,000 cases annually. Latest epidemiological data (2000-2001) shows that this district contributes over 15% of malaria cases of the state. *Anopheles culicifacies* and *An. fluviatilis* are two mosquito vectors responsible for malaria transmission in this area.

The state health officials at different levels were contacted for analysis of situation in the district and generation of data during November 2000 and August-September 2001, which will be helpful in the preparation of the action plan and implementation of Roll Back Malaria strategy.

The conclusions are as follows:

1. *The laboratory set up, case detection and treatment:* The quality of blood smear in general is very poor, resulting in poor staining and incorrect identification of malaria parasite species. Discrepancy was found while cross checking the slide especially the diagnosis of ring stage of *P. falciparum*. It is recommended to provide training in malaria microscopy and refresher course at yearly interval. Monitoring and cross-checking system is inadequate, which needs urgent attention. The technicians are inadequately deployed in PHCs with high malaria incidence. The number of staff posted at any PHC has no relation with malaria incidence. In high incidence reporting PHCs neither microscope nor technicians are posted. Therefore staff may be transferred from low incidence PHC to high incidence PHCs.

2. *Vector Control:* Currently three insecticides, DDT, malathion and deltamethrin are being used for indoor residual spraying for control of vector population. The data on insecticide resistance in malaria vector species is not available. There is no scientific rationale behind selection of villages to be sprayed and type of the insecticide to be used for indoor residual spraying. Synthetic pyrethroids are being indiscriminately used which may lead to development of resistance.

3. *Drug resistance:* Data on drug resistance could not be available from Pf Monotoring Team. 7-Day *in-vivo* drug susceptibility study carried out by the team revealed that the *P. falciparum* is susceptible to chloroquine. However, there are evidence of indiscriminate use of alternative drugs such as pyrimethamine-sulphalene combination, E-mal and bulaquine by private medical practitioners, shop-keepers and community. Majority of these groups are not aware of National Drug Policy. Efforts should be made to update their knowledge on present malaria drug policy.

4. *Treatment:* Although all the patients attending govt. health establishments are covered under Fever Radical Treatment, the parasitological results show large numbers of *P. falciparum* cases both with ring and ring with gametocytes

probably due to poor surveillance and non-compliance of drug consumption. This is primarily due to large numbers of tablets to be taken at a time. For example an adult patient has to consume at least 18 tablets of primaquine (2.5 mg) beside 4 tablets of chloroquine on day-1. This problem may be overcome by introducing blister pack (2 tabs) of chloroquine (600 mg) and primaquine (45 mg).

5. *Research input:* There is urgent need of research input to resolve some of the basic problem required for effective planning of malaria control strategy.

    i. Stratification of vector species distribution especially sibling species of *An. culicifacies* and *An. fluviatilis*, which differs in distribution pattern and relative vectorial efficiency

    ii. Vector incrimination studies to identify the vector species and transmission period for planning proper intervention strategies.

    iii. Monitoring of insecticide resistance in two malaria vectors *An. culicifacies* and *An. fluviatilis* for the selection of proper insecticide.

    iv. G.R. of breeding places for planning the release of larvivorous fishes for control of larval breeding.

    v. Drug sensitivity of *P. falciparum* and *P. vivax* against commonly used antimalarials.

    vi. Efficacy of 5-days radical treatment of primaquine in *P. vivax* should be studied

6. *Logistic:* Allocation of adequate fund should be made available against TA/DA and POL to implement proper monitoring and supervision, filling up of vacancies, training etc. Quality control of insecticides, insecticide spray, spraying equipments and drugs should be ensured.

7. *IEC:* Emphasis should be given to strengthen IEC activities for effective involvement of community.

Two workshops were organized, one at district headquarter, Tumkur, another at PHC C.N. Hally with representatives from government health officials, other government departments, NGOs, school teachers, representatives of community and panchayat, private health care providers etc, who are prospective potential partners. Different working groups came forward with specific recommendations for formulating malaria action plan.

While analyzing the malaria epidemiological data (1999-2000) in Karnataka state it was evident that beside few problematic talukas of Tumkur district adjoining few talukas of three other districts, namely Chitradurga, Chikmaguluru and Hussan are contributing more than 25% of total malaria cases and approximately 80% of the total *P. falciparum* cases (Table - , Fig – 3) in the Karnataka state.

For the preparation of malaria action plan these aspects may need utmost attention.

Introduction

Malaria is a major public health problem, endemic in over100 countries in the world. The World Health Organization (WHO) estimates there are over 300 million clinical cases every year, with over a million deaths. The Director-General of WHO initiated a new global partnership, Roll Back Malaria (RBM), to tackle malaria as a priority health disease. The RBM was initiated for the first time in Africa as over 90% of the disease burden occurs in Africa. Subsequently, RBM initiative was extended to India and other South-East Asian countries.

India has experienced resurgence of malaria in 1976s due to several logistic and technical reasons and 6.4 million cases were reported in 1976. As a result Modified Plan of Operation (MPO) was launched in 1977 to tackle the situation and malaria cases came down to 2.5 to 3 million cases annually by 1985. Since then the incidence of malaria has been contained to around 2-3 million cases annually. However, the proportion of *P.falciparum* cases and sharp increase in death due to malaria has been recorded mainly due to frequent outbreak

The aim of the Roll Back Malaria initiative is to reduce the malaria morbidity and mortality by utilizing the existing infrastructure and resources available according to the local need. RBM aims at health sector reform, community empowerment and human development to achieve sustainable reduction of malaria involving bilateral agencies, the research community, the private sector and NGOs. A strategic action plan for Roll Back Malaria was recommended during an inter country meeting of South East Asian countries held at WHO-SEARO, New Delhi in year 1999, which endorsed situational analysis of the district and identification of problem at the local level.

In this context five districts i.e., Tumkur (Karnataka), Aizwal (Mizoram), Jodhpur (Rajasthan), Goa and Keonjhar (Orissa) have been selected representing five different epidemiological zones of the country for malaria situational analysis by National Anti-Malaria Programme based on high malaria incidence. The aim of the present study was to analyze the situation of malaria, available infrastructure and health delivery system, their strength and weakness and resources (both government and non-government) that can be exploited for effective malaria control involving community. The present report is outcome of the two visits made during November 5-17, 2000 and August 26 to September 16, 2001.

It is envisaged that this report will be helpful in formulating RBM action plan for district level implementation by National Anti-Malaria Programme aiming to reduce the malaria burden in general.

Objectives

The general objective of the situation analysis is to facilitate the development of action plan for malaria control in the pilot districts under Roll Back Malaria Initiative.

Specific objectives:

1. To assess the strengths and weaknesses of the health infrastructure for supporting disease control activities at the state, district and at other administrative levels within the district.

2. To assess treatment and prevention practices at household and community level, and to identify community priority needs for health care delivery with reference to malaria.

3. To assess the strengths and weaknesses of the formal, informal, private and public health care delivery systems for malaria control.

4. To collect evidenced based data of malaria with special reference to case detection and treatment, disease prevalence, drug sensitivity of *Plasmodium falciparum*, prevalence of vector species and their abundance, host preferences, breeding habitats and insecticides resistance status in vector species.

5. To identify potential partners and opportunities for more effective intervention, prevention and treatment of malaria especially at the community level.

6. To identify ways to strengthen the health sector to deliver disease control interventions more effectively.

Methodology

1. The study was initiated after preliminary discussions with officials of National Anti Malaria Programme, Delhi, Regional Office of Health & Family Welfare, Bangalore and Directorate of Health & Family Welfare, Govt of Karnataka, Bangalore.

2. The district level officers of various Government departments and Volunteer Organizations based at Bangalore and Tumkur, private health practitioners, teachers, elected members of Panchayat etc., who can be associated for malaria control activities in the district as potential partners, were contacted.

3. For collection of entomological, parasitological and other relevant data of Tumkur, concerning state health officials were approached.

4. The study villages were selected on the basis of last two years (1999-2000) epidemiological data. Following evidenced based data were generated from study villages.

   Entomological:

   a. Estimate of relative densities of malaria vector species, sibling species composition and mosquito fauna.

   b. Breeding habitats of anophelines

   c. Susceptibility status of vector species against commonly used insecticides

   Parasitological:

   a. Fever survey in villages of 2 PHCs (covering about 1000 population each PHC), one with high malaria and other with low malaria incidence.

   b. Susceptibility of *P. falciparum* against chloroquine.

   c. Collection of epidemiological data from two selected villages.

5. Two workshops were organized, one at district headquarter, Tumkur, another at C. N. Hally PHC of district Tumkur. The representatives of various govt. departments, NGOs, health care providers and community representatives, who can be potential partners in implementing Roll Back Malaria by participating directly or indirectly, were invited to attend the workshop.

District Profile

Salient features of district profile of the district Tumkur, one of the malaria endemic districts of Karnataka state are given in table-1. Map showing the location of district Tumkur, Karnataka, India is given in figure-1.

1. Geographical: Tumkur is situated in the south- western part of the country at latitude 13.2° N and longitude of 77.08' E. The district is spread into 10596 km^2 and comprises of 10 talukas, 12 towns and 4054 villages. The ratio of area under urban/rural is 1:5.

2. Climate: The temperature in this area ranges between 14.2 to 33.1°C and the relative humidity (RH) ranges between 27 to 90%. The average annual rainfall is 587 mm.

3. Demographic features: The population of district is 2305819 with population density of 218 per km^2, mainly residing in rural areas and agriculture is their main occupation. The average per capita income is Rs 4427. Major crops in this area are Ragi, paddy, jowar and coconut. The literacy rate in males and females are 66 and 42 respectively.

4. Health indicators: The birth rate and infant mortality rate and death rates are 22, 54 and 7.8 (per thousand) respectively.

Health Infrastructure

The details of health infrastructure present in district Tumkur are given in table-2. There are 2 general hospitals, 38 Health units, 93 Primary Health Centres (PHC) and 376 sub-centres in the districts besides 646 Drug Distribution Centres (DDC) and 4 Fever Treatment Depots (FTD). Out of 93 PHCs, only 81 are reporting malaria in the district. The organizational and structural functions of health system are shown in table-3. Malaria is one of the major diseases that prevail in the district Organizational structure of different government health agencies responsible for malaria control in the state and district are shown in table 4-9.

Malaria Profile

Malaria is the main health problem in Karnataka state. Tumkur is one highly malarious district of Karnataka and contributes over 15% of malaria cases of the state during year 2000-2001. The data on malaria cases reported Karnataka state and in district Tumkur since 1990 are shown in table-10 & 11. On an average over 15,000 malaria positive cases are reported annually in Tumkur district, of which >25% are *P. falciparum*. Malaria incidence (API) in the district during last 10 years ranged between

1.6 & 17.2. Malaria is mainly a rural problem in Tumkur district, however, Tumkur town also reports malaria incidence and is covered under Urban Malaria Scheme. Malaria incidence reported from Tumkur town since 1997 is given in table-12. In Tumkur town temephos and fenthion are being used as larvicide beside pyrethrum space spray as additional measures in and around the houses where malaria cases are detected.

An. culicifacies and *An. fluviatilis* are the two major vectors responsible for the transmission of malaria in this area. The vector control strategy relies mainly on residual insecticides spraying of DDT, Malathion and synthetic pyrethroids. The major vector *An. culicifacies* has developed resistance to DDT and partially to malathion. Among other vector borne diseases, Japanese Encephalitis and Dengue are prevalent in some districts of Karnataka, but there is no confirmed deaths reported from this district. Mosquito nets are used occasionally only by individuals.

Based on the malaria incidence of last few years Tumkur district authorities have identified following talukas namely C.N. Halli, Sira, Gubbi, Thuruvekere, Thiptur and part of Tumkur as high risk problematic areas of the district, which is shown in figure 2.

Table-1.Tumkur District Profile

(KARNATAKA)

1.	Geographical area		10596 km^2
2.	Latitude and Longitude		13.2^O N and 77.08' E
3.	Terrain		Undulating >95%
4.	Population (1991 census)		2305819
5.	Urban (area)		382163 km^2
6.	Rural (area)		1923656 km^2
7.	Percapita income		Rs. 7427
8.	No. of Town with municipal		12
9.	No. of Talukas		10
10.	No. of villages		4054
11.	Density/ sq.km		218
12.	Village Panchayats		321
13.	Male – Female ratio		1 : 0.95
14.	Literacy rate (%)		Male: 66.49; Female: 41.93
15.	IMR/ birth rate/ Death rate		54 / 22 / 7.8
16.	Rainfall range		688-861 mm
17.	Temperature range		14.2 – 33.1^{0}C
18.	Relative humidity (RH)		27 – 90%
19.	Area under cultivation		543653 (Hectare)
20.	Important crop		Ragi, Paddy, Jowar, Coconut
21.	Live stock		1416532
22.	Channels	Mainwater bodies	270
23.	Dam		4
24.	Tank		26712
25.	Wells		16943
26.	Bore wells		55852
27.	Lift irrigation		151
28.	Others		34

Table-2. Health Infrastructure in District Tumkur

1.	General hospital (Tumkur)	1 (400 bed)
2.	General hospital (Tiptur)	1 (100 bed)
3.	Taluk hospital (KSHDP)	7 (50 bed)
4.	Ayurvedic hospital	28
5.	Urban malaria scheme (Tumkur)	1
6.	Primary Health Unit	38
7.	PHC	93 (Malaria reporting 81)
8.	Sub-centres	376
9.	DDC (Drug distribution center)	646
10.	FTD (Fever treatment depot)	4
11.	MPW (Multi purpose worker)	376
12.	ANM (Auxiliary Nurse and Midwife)	555

Table-3. Public Health System: Organizational and Structural Functions

Level of Public Health System	List of organizations	General function	Functions specific to MCP
Central (Delhi)	Directorate of health services (Ministry of Health and Family Welfare) Government of India.	Highest planning and policy making body for the control of different communicable and non-communicable diseases in the country.	Highest planning and policy making body and responsible for all budgetary allocation for malaria.
	Directorate of National Anti-Malaria Programme (Ministry of Health and Family Welfare) Government of India	Directorate of National Anti-Malaria Programme (NAMP) Delhi (under DHS) for planning, policy making and procurement body in respect of malaria, J.E, kala-azar and filariasis control.	NAMP Directorate is responsible for advisory, planning, policy making, procurement of insecticides, mosquito nets, drugs, spray equipments, microscopes, diagnostic and other supplies.
	Malaria Research Centre (Indian Council of Medical Research).	Malaria Research Centre (ICMR) Delhi undertakes basic, applied and field research in the field of malaria and other vector borne diseases.	Malaria Research Centre provides research support to NAMP on various aspects of epidemiology and control of malaria. It has a network of 12 field stations located in different eco-epidemiological zones of the country. Provides the testing ground for new technologies and innovative approach, and helps in the transfer of technology through training, field demonstration and mass awareness programmes involving various media. The center also provides opportunity to the young scientists & paramedical staff to undertake advanced research and training for capacity building.

	National Institute of Communicable Diseases (Ministry of Health and Family Welfare) Government of India.	National Institute of Communicable Diseases (NICD) is responsible for basic and applied field research in the field of different communicable diseases including malaria.	Supports the National Anti-Malaria Programme in providing research and manpower development.
State (Karnataka)	Directorate of Health services located at Bangalore.	Director, Health Services, is overall incharge of the health system including all communicable and non-communicable diseases in the state for planning, policy making supervision, guidance and providing budget.	Exclusively meant for supervising, planning and implementing malaria control operations in the state.
	Regional office for Health & Family Welfare Government of India, Bangalore.	Co-ordinates between the state and center on all health matters.	There is a separate cell for overall co-ordination of malaria control between state and central directorates.
	Pf Monitoring unit	To monitor resistance status in malaria parasite to chloroquine.	Monitoring resistance status in malaria parasite against anti-malarials and provides research input to the state malaria control programme.
	Malaria Research Centre field station (ICMR) Bangalore.	To help the state govt. in transfer of technology in bio-environmental control of malaria.	To conduct research as per the needs of state govt. and to investigate any outbreak of malaria in the state.
	National Institute Communicable Disease Bangalore.	Surveillance and research specific to plague.	Provide supports to state health authorities to investigate malaria out break and helps in monitoring as and when requested.
District (Tumkur)	District Health Officer (Under Zila Parishad).	District health officer is the chief and responsible for all health programmes in the state under Zila Parishad of the Panchayat Raj System.	DHO supervises malaria control programme and provides budget for the same.

	District malaria officer.	Overall incharge of malaria control operations in the district.	Overall incharge of malaria control operations in the district without administrative and financial control, which is control by District Health Officer.
Sub Divisions (Taluk)	Taluk Health Officer	Responsible for all health problems of the taluka.	Also responsible for supervision of malaria control.
Primary Health Centre (PHC)	The Medical Officer incharge is responsible for all health care system of PHC.	Malaria inspector and Health supervisor (male & female) are responsible for supervision of malaria surveillance in the PHC.	Health supervisors are multipurpose workers responsible for supervision over health workers of sub-centres.

Table-4.ORGANOGRAM OF HEALTH SERVICES

STATE KARNATAKA

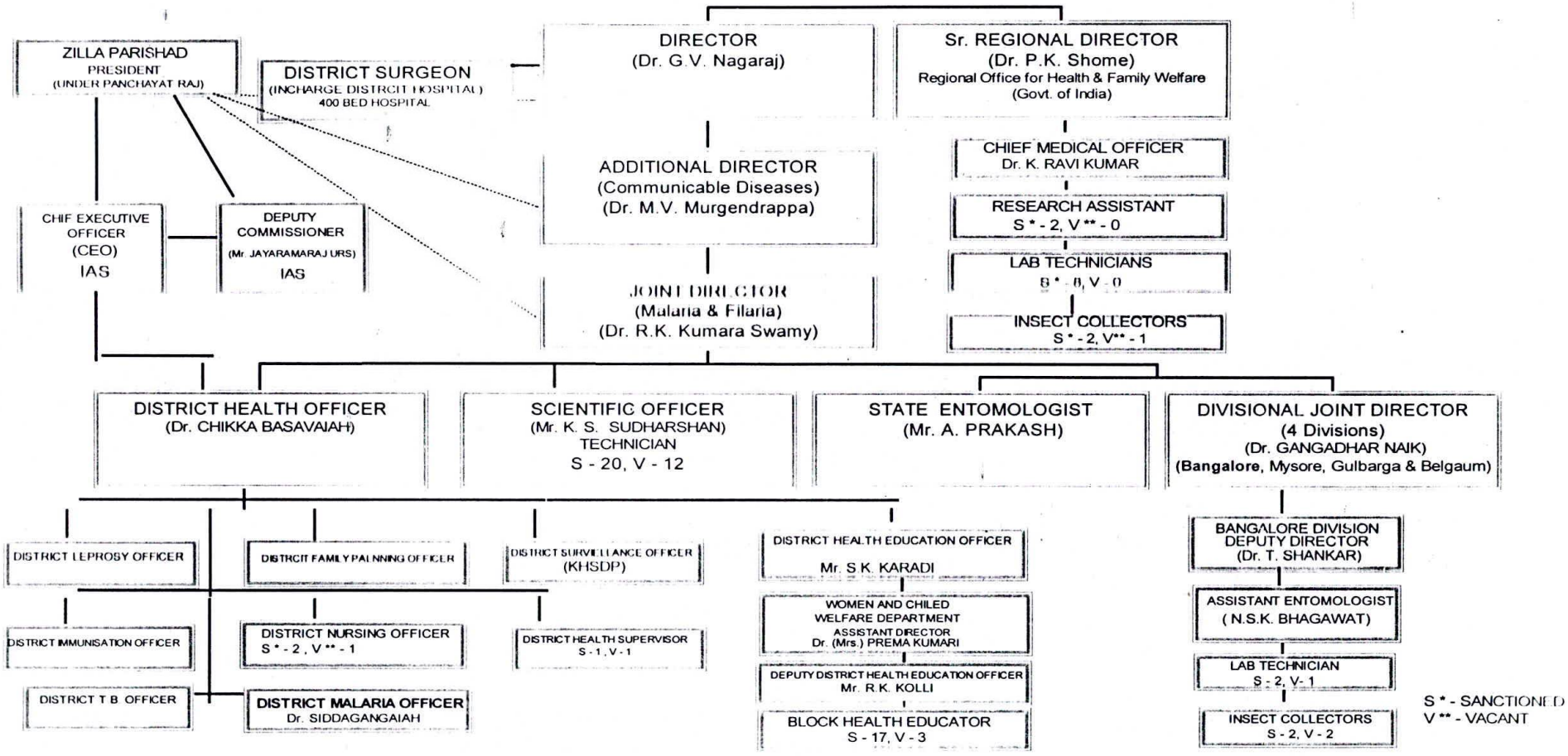


Table-5. ORGANOGRAM OF DMO OFFICE
(DISTRICT TUMKUR)

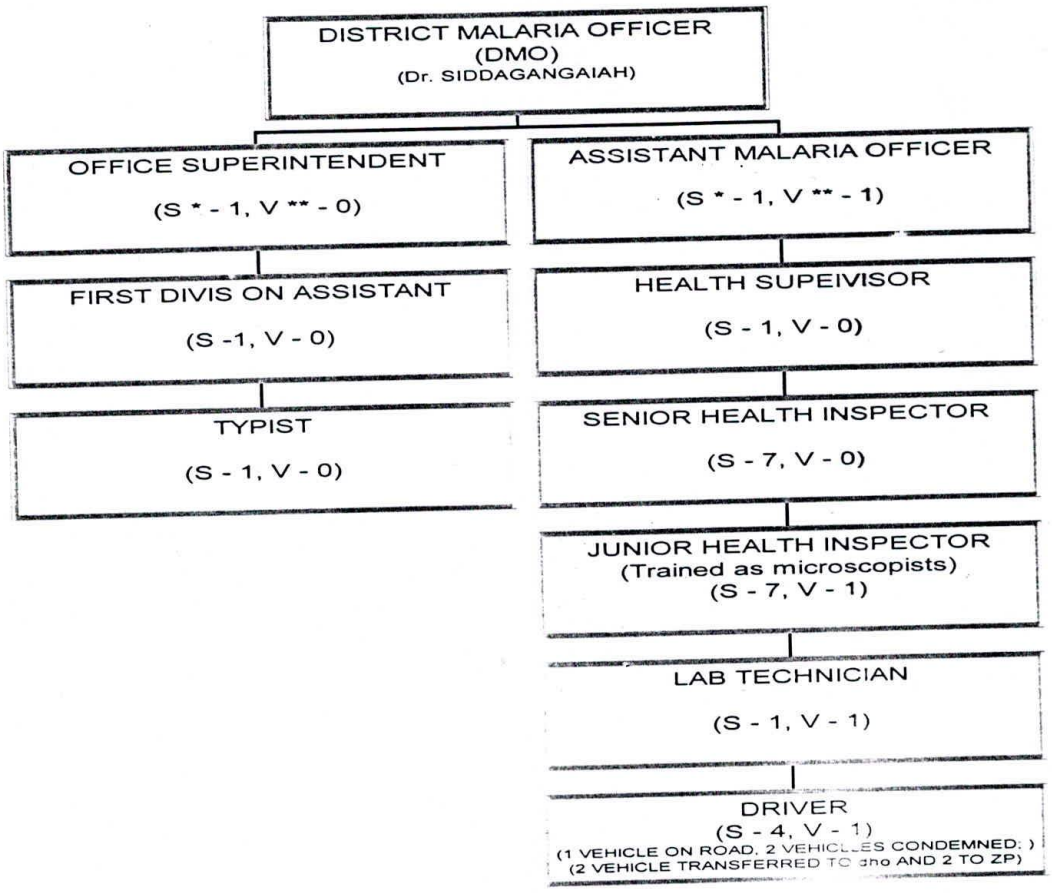
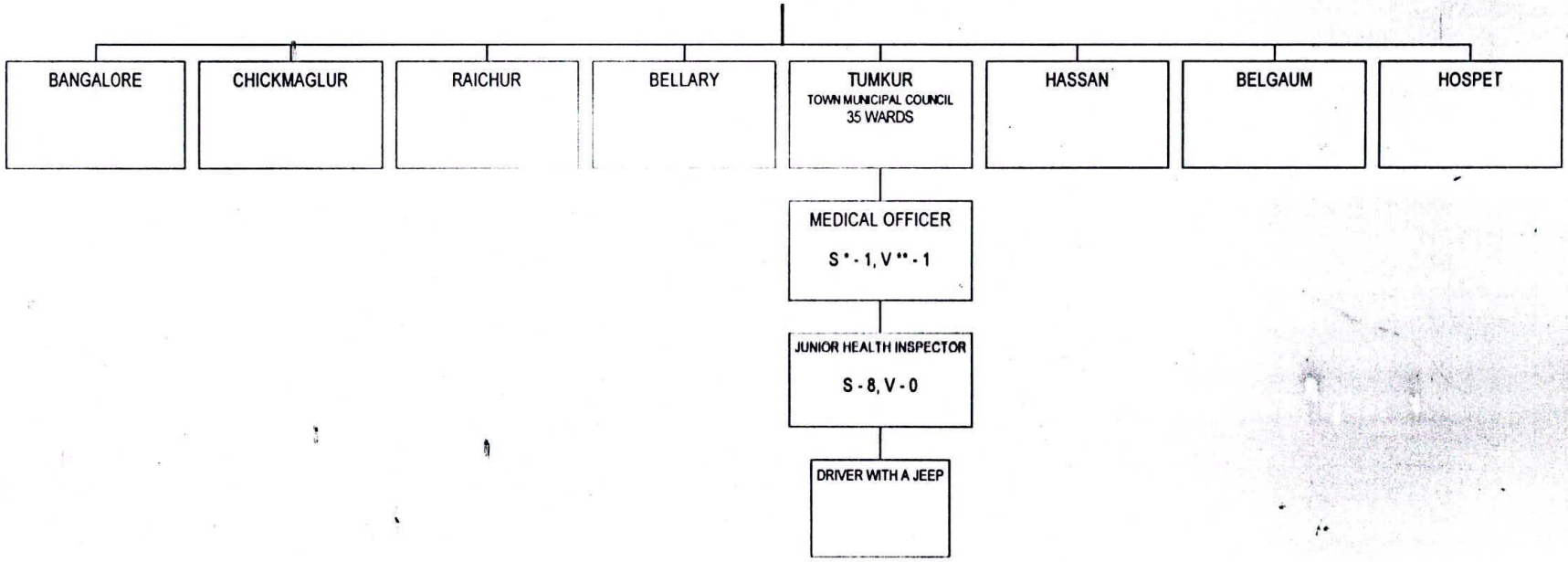


TABLE- 6. CITIES UNDER URBAN MALARIA SCHEME



S* - SANCTIONED
V ** - VACANT

TABLE-7. ORGANAOGRAM OF A TALUK HOSPITAL

TALUK - CHIKKANAYAKANA HALLI

(DISTRICT TUMKUR)

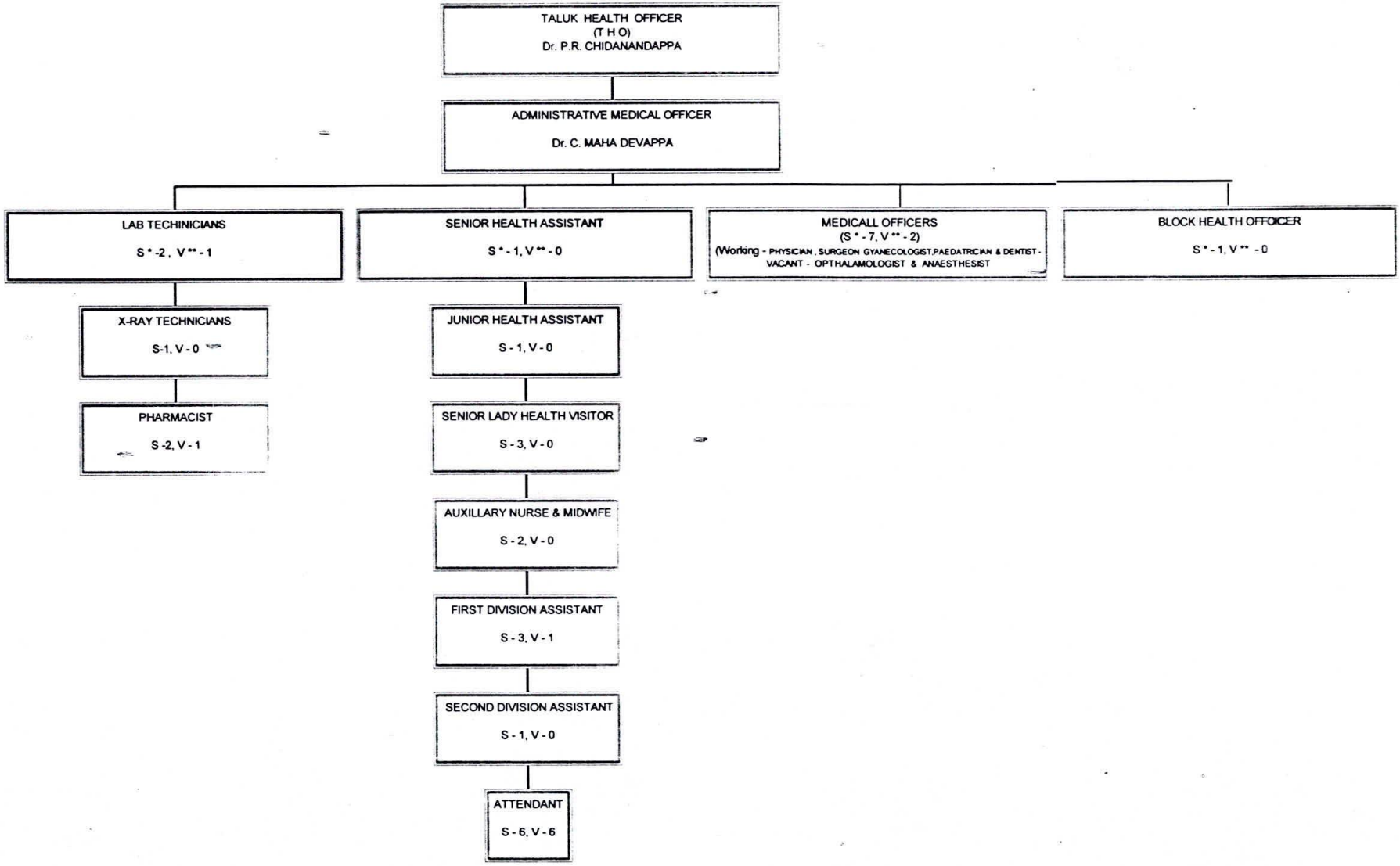


TABLE-8. ORGANOGRAM OF PRIMARY HEALTH CENTRE

PHC – CHIKKANAYAKANA HALLI

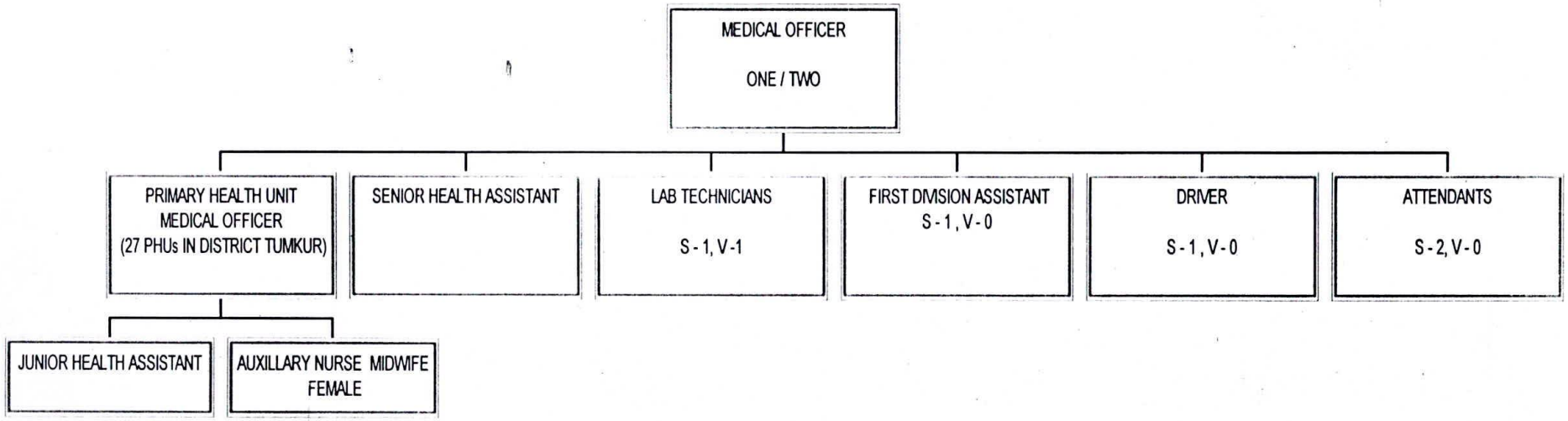
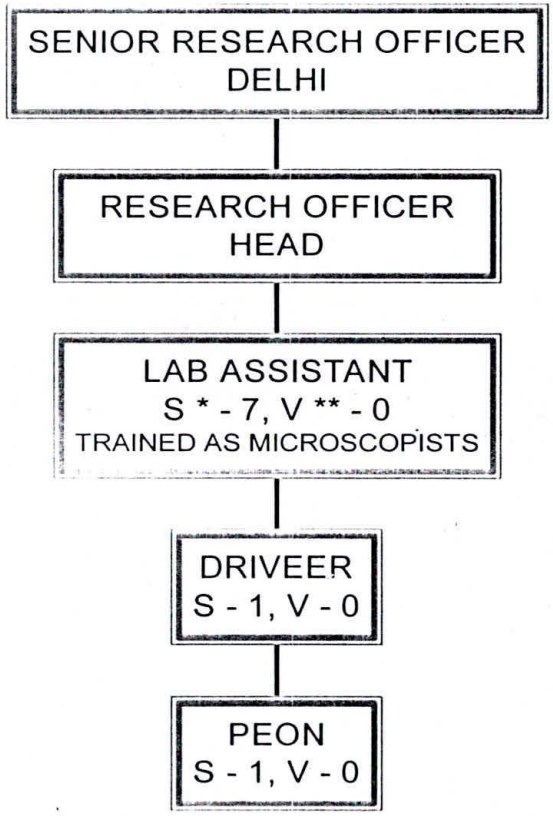


TABLE-9. ORGANOGRAM OF *Plasmodium falciparum* MONITORING UNIT, BANGALORE, KARNATAKA



S* - SANCTIONED
V ** - VACANT

Malaria Profile of Karnataka

(1991-2001)

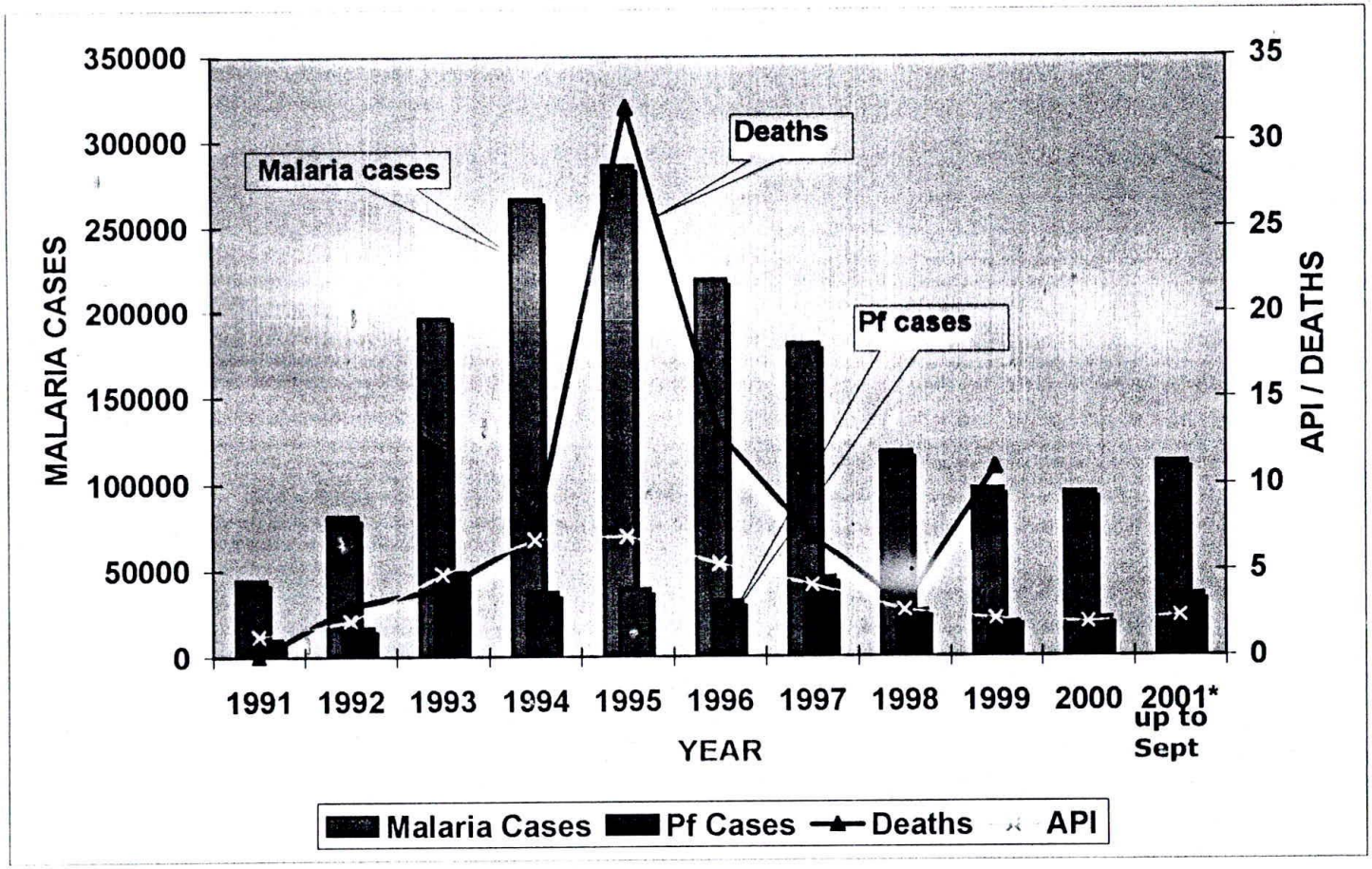
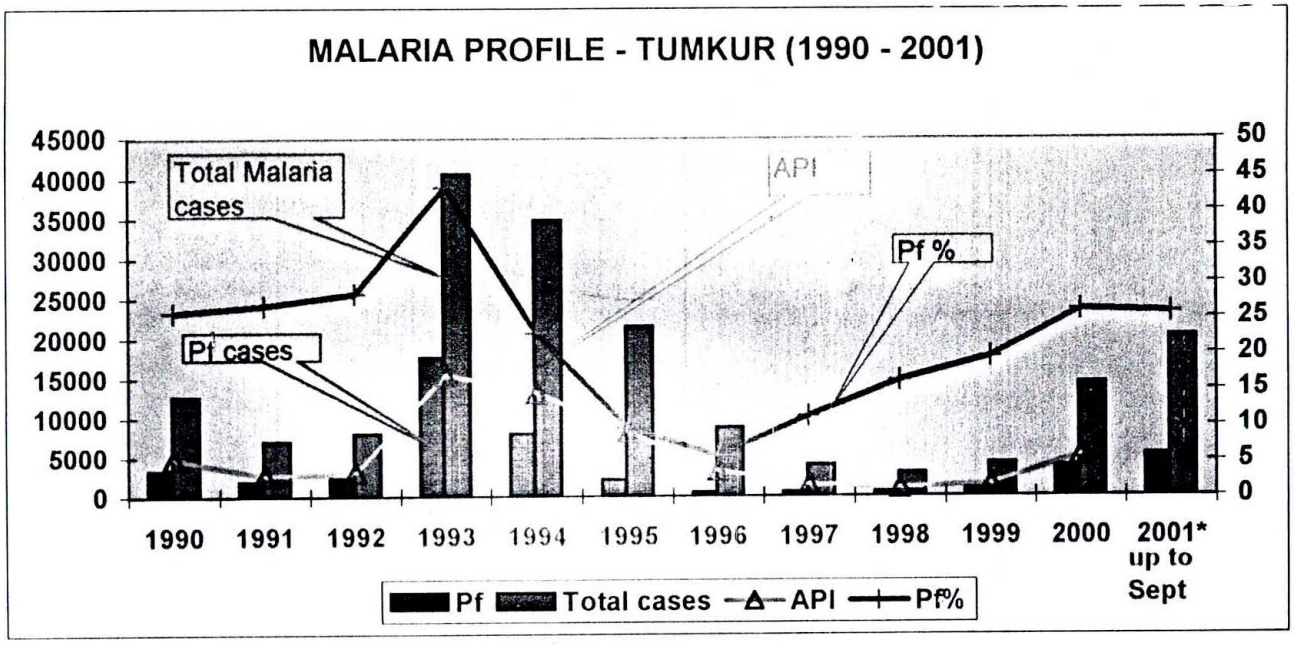


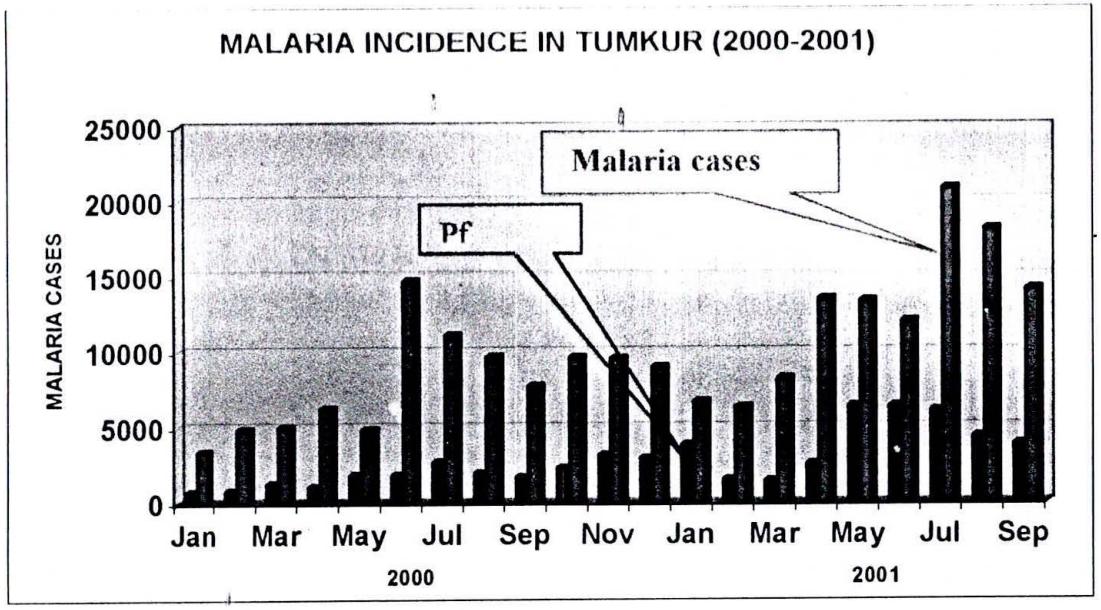
Table-10. Incidence of Malaria

(KARNATAKA STATE)

Year	BSE	Malaria Cases	Pf Cases	Radical treatment	No. of confirmed deaths	ABER	API	SPR	SfR
1991	6845523	44565	10135	43430	0	17.2	1.2	0.7	0.2
1992	6918592	81057	16826	63200	3	17.1	2.1	1.2	0.2
1993	7098510	196466	49246	190644	4	17.3	4.8	2.8	0.7
1994	7110997	266679	37789	257338	7	17.9	6.8	3.8	0.5
1995	7111888	285830	39601	279535	32	17.4	7.0	4.9	0.6
1996	7681802	219198	32606	216127	13	18.5	5.4	2.9	0.4
1997	7613013	181450	46326	180976	7	17.8	4.2	2.4	0.6
1998	7568155	118753	26776	115695	3	17.3	2.7	1.6	0.4
1999	8185995	97274	21416	94578	11	18.6	2.2	1.2	0.3
2000	8004765	95387	22220	16.7	2.0	1.2	0.3	16.7	2.0
2001*	6818646	112907	36356	14.3	2.4	1.7	0.5	14.3	2.4

* up to August.


MALARIA PROFILE - TUMKUR (1990 - 2001)
Total Malaria cases
Pf cases
API
Pf %
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
50
45
40
35
30
25
20
15
10
5
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001* up to Sept
Pf
Total cases
API
Pf%


MALARIA INCIDENCE IN TUMKUR (2000-2001)
Malaria cases
Pf
MALARIA CASES
25000
20000
15000
10000
5000
0
Jan
Mar
May
Jul
Sep
Nov
Jan
Mar
May
Jul
Sep
2000
2001

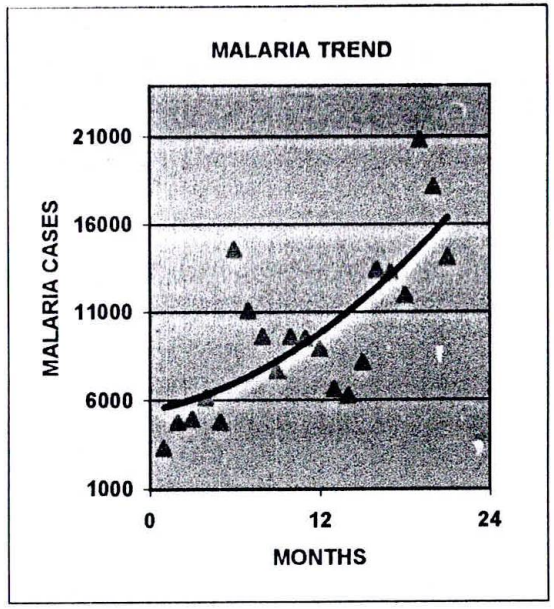

MALARIA TREND
MALARIA CASES
21000
16000
11000
6000
1000
0
12
24
MONTHS

Table-11. Incidence of Malaria
(TUMKUR DISTRICT)

Year	Population	BSE	Pv	Pf	Total	ABER	API	AFI	SPR	SfR	Pf%
1990	2323921	454268	9393	3290	12683	19.5	5.4	1.4	2.7	0.72	25.9
1991	2323921	478035	5159	1895	7054	20.57	3.03	0.8	1.47	0.39	26.88
1992	2323921	451419	5731	2293	8024	19.4	3.45	0.09	1.77	0.05	28.57
1993	2347610	506058	23013	17605	40618	21.46	17.22	7.4	8.02	3.47	43.34
1994	2369576	456863	26788	8010	34798	19.8	14.68	3.3	7.6	1.75	23.01
1995	2369576	448059	19362	2091	21453	18.9	9.05	0.8	4.78	0.46	9.74
1996	2369576	465672	8234	516	8750	18.8	3.6	0.02	1.86	0.11	5.8
1997	2369576	421561	3563	460	4023	17.7	1.6	0.19	0.9	0.1	11 4
1998	2440059	459273	2334	476	2910	18.8	1.19	0.19	0.6	0.1	16.35
1999	2440059	442897	3348	819	4167	18.15	1.7	0.33	0.9	0.18	19.65
2000	2440059	646654	10550	3746	14296	26.50	5.86	1.54	2.21	0.58	26.20
2001*	2440059	492020	14982	5218	20200	20.16			4.11	1.06	25.83

* Up to August

Table-12. Urban Malaria Scheme in Karnataka vs Tumkur

KARNATAKA

YEAR	BSE	MALARIA CASES	PF	RADICAL TREATMENT
1997	150267	14450	937	14213
1998	141008	8739	750	8355
1999	114237	4991	244	4991
2000 (AUG)	76367	1647	240	1572

TUMKUR

S.NO.	YEAR	POP.	BSE	+VE	PF	RT
1.	1997	200000	6685	157	28	155
2.	1998	239000	9552	142	16	142
3.	1999	239000	8299	96	22	96

PROBLEMATIC TALUKAS IN TUMKUR DISTRICT

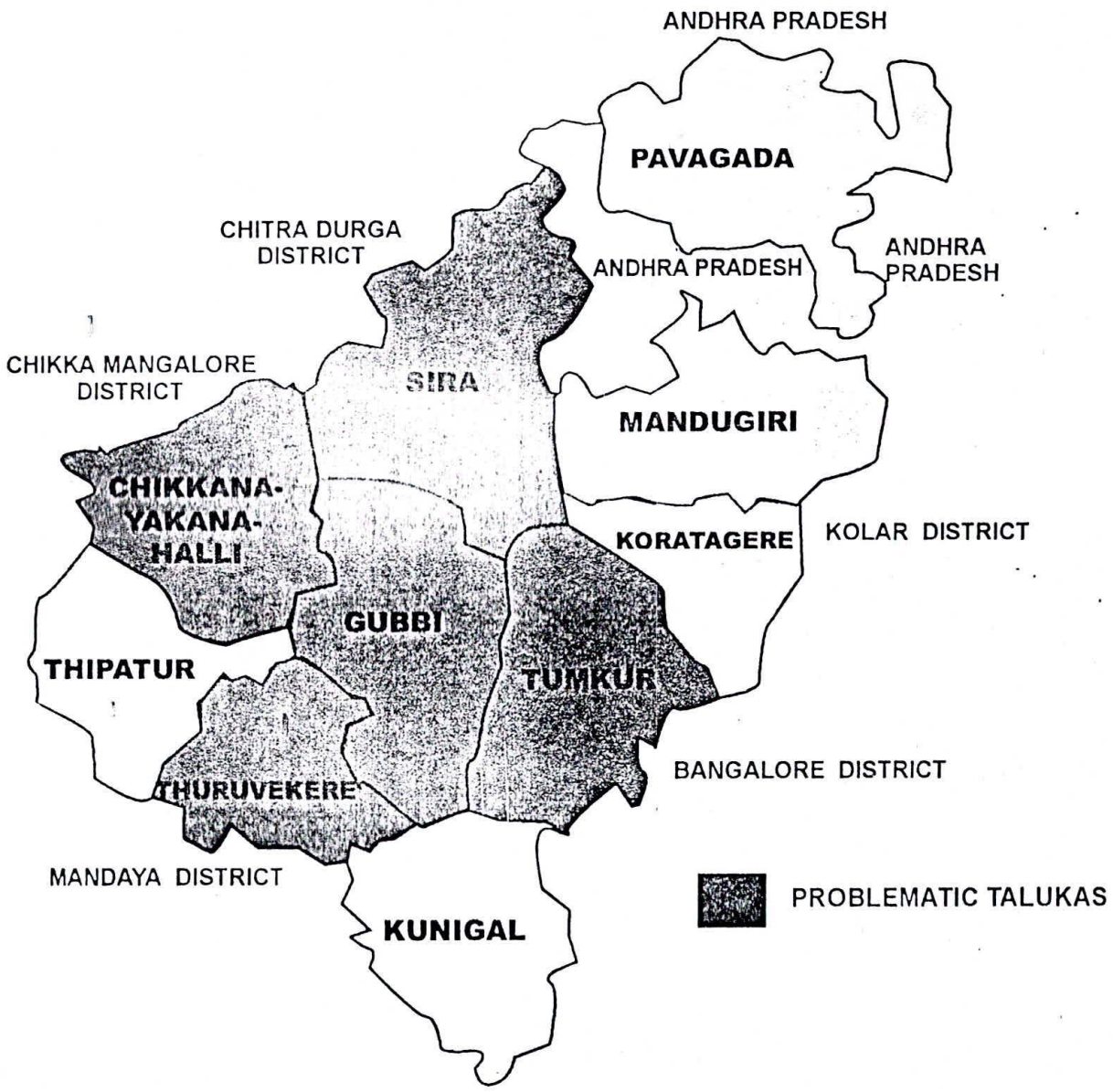


FIG. 2

Malaria prevalence

To collect evidence based data field visit were made in three PHCs, Huliyar, Mathigatta and Dasudi of Taluk C. N. Hally. Team also visited adjoining Taluk Hospital at Sira and had detail discussion on malaria situation of Taluk. Before undertaking field survey, several discussions were made with state health officials and data generated on malaria epidemiology were analyzed. The data on malaria prevalence in Tumkur district were obtained from the office of the District Malaria Officer, Tumkur.

The month wise malaria cases in district Tumkur during year 2000-2001 are shown in table-13 and fig-4. Though the malaria cases appear throughout the year, there are two peaks of malaria, a spurt of large peak around April-August and a very small peak around December. The compilation of malaria cases revealed that malaria cases have increased substantially in year 2001 as compared to preceding year. In year 2001 till August 20200 malaria cases have been detected as against 14296 cases in whole year of 2000. There is 78% increase in total malaria cases and 86% increase in *P. falciparum* cases in 2001 as compared to preceding year (Jan-Aug data).

The taluka-wise malaria cases during year 2000-2001 are shown in table-14. The two taluka, C. N. Hally and Sira had maximum number of malaria cases especially *P. falciparum* cases. The two talukas together contributed 65% of total malaria cases and 68% of *P. falciparum* cases appeared during year 2000 in the district. In Taluk C. N. Hally, about 1/3rd of malaria cases are reported from two PHC, C. N. Hally and Mathigatta. The month wise data on malaria incidence of PHC C.N. Hally are shown in table-15. The incidence of total malaria cases and *P falciparum* cases have increased in 2001 from preceding year in PHC Mathigatta, whereas decreased in PHC C. N. Hally table-16. Further the subcentre-wise malaria incidence of PHC C.N. Hally and Mathigatta are given in table 17 & 18.

1. Fever Survey

Few villages from these two PHC were visited by the team for point prevalence study. In order to find out the malaria prevalence the fever survey was carried out in 6 villages of Mathigatta PHC alongwith passive slide collection carried out at Mathigatta PHC Hospital. The results of slide examination are shown in table 19.

Examination of blood smear revealed overall SPR to be 24.44, ranging between 8.62 and 60.00. It may be pointed out that majority of malaria cases were *P. falciparum* (Pf% =92.31). Most of these cases were found to have ring stage indicating very poor surveillance, although the annual blood examination rate (ABER) is as high as 25%.

It was observed that the active surveillance in term of slide collection is poor by existing NAMP norm. This is evidenced by comparison of single day's point prevalence

surveillance data generated during the field visit vs. 7 months data (Jan-Aug 2001) by state health agency.

It may be pointed out that during our point prevalence study carried out in a primary school revealed large number of student are infected with *Plasmodium falciparum* showing lack of typical clinical symptom of malaria. Hence existence of asymptomatic of malaria cases cannot be ruled out in this area. In view of this suggested that detailed investigation should be carried out to find out the presence of asymptomatic of malaria cases.

2. *Malaria Microscopy*

The study team visited 2 PHCs of Taluk CN Hally i.e., CN Hally and Mathigatta, and PHC Sira (Taluk Sira). Blood smears collected from patients who reported to PHC hospital in the month of August and September 2001 were crosschecked for malaria parasites. It was observed that quality of blood smear and staining is very poor in general. Examination of blood smears revealed discrepancy in result particularly false negativity of *P. falciparum* cases by PHC technicians (Table-20). It was observed that technicians are capable of identifying *P. falciparum* gametocytes only. Ring stage of *P. falciparum* parasite invariably missed by the technicians. Out of 300 confirmed negative slides, 12 were found positive for *P. falciparum* rings only. All together *P. falciparum* rings were found to be missed in 23 slides.

It may be mentioned here that our vector control strategy in a given area is mainly relies on incidence of malaria; hence proper reporting of cases is essential. Underreporting of malaria cases resulting from poor quality of blood smear, staining and technical inefficiency is a great concern not only for policy decision but also reducing morbidity and mortality as well as transmission risk.

3. *Treatment*

Tumkur district have been identified as high risk area due to occurrence of few malaria out break in the year 1999-2000. As per the guidelines of NAMP, all fever cases are given Fever Radical Treatment (FRT) with 1500 mg of chloroquine (adult dose, 600 mg each on D_0 and D_1 and 300 mg on D_2) and 45 mg of primaquine on day 0. Subsequently on examination of the blood smear, if found positive for *P. vivax*, three days of primaquine treatment (30 + 30 + 15 mg) are given for radical cure subsequently within 3 weeks.

Data analysis revealed that the FRT is not very effective in containment of falciparum malaria. Analysis of parasitological data generated by team and PHC laboratory revealed that majority of *P. falciparum* cases detected were found to have ring and gametocyte. This strongly indicates poor compliance with reference to drug consumption. In such circumstances the efficacy of FRT should be investigated to reduce the drug pressure.

At present under FRT large numbers of anti-malarial tablets are given for treatment. The number of tablets given for adult is: 1500 mg of chloroquine consisting of 10 tablets (10+10+2) and single dose of 45 mg of primaquine consisting of 18 tablets (2.5 mg). Therefore the patient is supposed to take total of 22 tablets on first day in presence of health worker which probably never happened. Due to such large number of tablets to be

consumed by the patients the compliance of taking the drug is probably very poor. Hence it is recommended that the NAMP should made available chloroquine and primaquine tablets of higher strength to reduce the no. of tablets in blister pack as per Maharashtra model. It is envisaged that such action will improve the patients' compliance to drug consumption.

4. *Chloroquine resistance*

In order to find out the drug susceptibility status of *P. falciparum* against chloroquine, we conducted 7-day *in-vivo* drug sensitivity tests, following WHO test protocol, against 19 *P. falciparum* cases. The results of *in-vivo* test suggest that chloroquine is very effective and should be used as first line of treatment (table 21).

It may be pointed out that there is Pf monitoring team at RHO office at Bangalore, which is adequately staffed. The status of chloroquine resistance, as monitored by monitoring team, could not be obtained inspite of our best effort.

It may be mentioned that majority of patients are invariably treated either with sulphadoxine-pyrimethamine combination or E-mal (α and β artether) as a first line of treatment, as evidenced by discussion with private medical practitioners, community and chemists. Various medical stores were visited to know the common anti-malarial drugs available, which reflects common drugs being used by patients either by prescription of General Practitioners or self-medication. The E-mal and bulaquine is the most commonly used drugs found available with medical stores. In view of efficacy of chloroquine it is suggested that community and private health care agencies should be sensitized about NAMP drug policy and should be advised to use chloroquine as first line of treatment to reduce the drug pressure and delaying the development of resistance to front line drugs.

5. *FTD/DDC:*

Currently only few Fever Tratment Depot (FTD) and Drug Distribution Centre (DDC) are working in Tumkur district. Only Anganwari workers are helping out in FTD and DDC. No other community leader is engaged in this service. It was observed that there is poor liaison between MPW and FTD/DDC. The functioning of FTD/DDC should be improved by improving liaison with MPWs and involvement of community.

Malaria Entomology

1. *Vector prevalence:*

Indoor resting mosquitoes were collected from some of the villages of PHC Mathagatta, CN Hally and Desudi. The anopheline fauna and their relative density in study villages are given in table-22. Two vector species *Anopheles culicifacies* and *An. fluviatilis* were found in very small number in this area. The low density of vector species is probably due to prevailing drought condition during our visit. The examination of abdominal conditions of indoor resting *An. culicifacies* revealed high proportion of gravid mosquitoes.

2. *Sibling species composition:*

Under RBM initiative necessary technical assistance and strategic investment for the development of better tools and intervention strategies should be provided through focused research. In this context, it may be pointed out that in Karnataka state vis-à-vis Tumkur district, *An. culicifacies* and *An. fluviatilis* have been recognized as vector. It is well known that both these vector species are complexes of sibling species, which greatly differ in distribution pattern and transmission potential. Hence it is desirable that the whole state should be stratified based on the distribution of different sibling species of *An. culicifacies* and *An. fluviatilis* and their relative transmission potential. Vector incrimination should be carried out to identify the vector responsible for malaria transmission and transmission period for planning effective vector control strategies.

Limited studies have been done on sibling species composition of *An. culicifacies*. MRC data suggest that the *An. culicifacies* population in this area comprises of about 72% species A (vector) and 28% species B (non-vector). However no data is available on sibling species composition of *An. fluviatilis*.

3. *Breeding sites:*

Study carried out in some villages show that there are limited mosquito breeding sites in rural area such as Tanks, Ponds, Wells etc which can be managed by introduction of larvivorous fishes, Gambusia and Guppy. These breeding sites remain generally perennial and therefore fishes can sustain in these sites. Such demonstration has already been carried out by MRC team in three districts of states. These fishes are available in millions in different parts of the state. In all water bodies these fishes should be introduced and subsequently schedule monitoring should be carried out to find out the propagation and effectiveness of fishes. There is no information of village wise breeding habitates, therefore GR should be carried out for successful use of larvivorous fishes. Some perennial Tanks/Ponds should be identified as hatcheries for regular replenishment of larvivorous fishes in mosquito breeding habitates. Other state department such as fisheries department should be involved for technical help and transportation of fishes. Technical expertise of MRC, Bangalore may also be exploited.

4. *Insecticide spray history:*

The history of insecticides spray in Tumkur district during year 2000 and 2001 are given in Table-23. During year 2000 two insecticides, DDT and deltamethrin and in the year 2001 three insecticides i.e. DDT, deltamethrin and malathion were used. First round of spray was carried out during 15th February to 15th April, second round during 15th July to 15th September and special round in August each year. During year 2000, deltamethrin has been sprayed in 10 PHC in regular spray schedule and in 6 PHCs as special spray round, while in 2001 deltamethrin was used only during special round.

5. *Insecticide resistance:*

The present status of insecticide resistance could not be monitored during study tour due to very poor vector density in the study area. The data on insecticide resistance is inadequate with state health agency. For effective planning of vector control, insecticide resistance data should be generated at sub-centre level. In absence of such data indoor residual spraying strategy may not be cost-effective. There is no supply of insecticide impregnated paper to monitor the insecticide resistance against different malaria vectors hence data on insecticide resistance is not available. It may also be mentioned that their is inadequate allocation of financial grant to meet the TA/DA of the staff and POL for the transport vehicle which are absolutely essential to undertake the studies on insecticide resistance.

As there was no sufficient data on insecticide resistance against different malaria vectors rationale for the selection of insecticide to be used in a given area for residual spray found to be questionable. Even synthetic pyrethroids are being used frequently, which involve high cost, without evidence of resistance against cheaper insecticides. It appears that the choice and schedule of insecticide spray is decided on the basis of availability of insecticide. It is strongly recommended that insecticide resistance in vector must be monitored at sub-centre level for judicious use of insecticides.

Infrastructure:

It was observed that in Mathigatta PHC, which is one of the high incidence reporting PHCs. In this PHC neither microscope was available nor any laboratory technician was posted for blood slide examination.

In spite of 15 day's training given to all the technician during the initial appointment it was surprising that the quality of blood smear preparation and identification of parasite species was found to be very poor. Therefore, it is suggested that refresher training course should be organized immediately to improve the quality of blood smear preparation, staining and identification. Cross-checking system existed at district and state headquarters as per NAMP norm however the functioning of this cross checking mechanism is inadequate. Hence it is suggested that the urgent attention should be given to improve the cross checking mechanism.

The staffing pattern, numbers of sanctioned and vacant posts of health workers used in malaria control are shown in table-24. Substantial numbers of staff position are vacant. The number of staff posted at each taluka has no relation with number of malaria cases in the Taluka. The staff therefore may be transferred to problematic areas particularly C. N. Hally and Sira, which contribute 65% of the total malaria cases in the district.

It was observed there is a great burden of record keeping and reporting to the peripheral staff at district and PHCs. These data are rarely analyzed for decision-making particularly deciding about the intervention strategies. The delivery of intervention strategies requires urgent strengthening of staff, and thus monitoring of the relevant components of the health sector ranging from health policies, health system management, service delivery and involvement of other important sectors needs immediate attention.

There is urgent need of providing training to health officials involve in malaria control. The training needs of health personals are summarized in table-25. Besides training there is need of effective cross-checking mechanism and supervision of staff. It was observed that proper cross checking mechanism and supervision as mentioned in NAMP's guidelines are not being effectively followed.

The poor supervision and monitoring is also due to inadequate fund allocation against TA/DA. Bills pertaining to TA/DA are generally pending for years.

Table-13. Incidence of Malaria
District-Tumkur

YEAR 2000

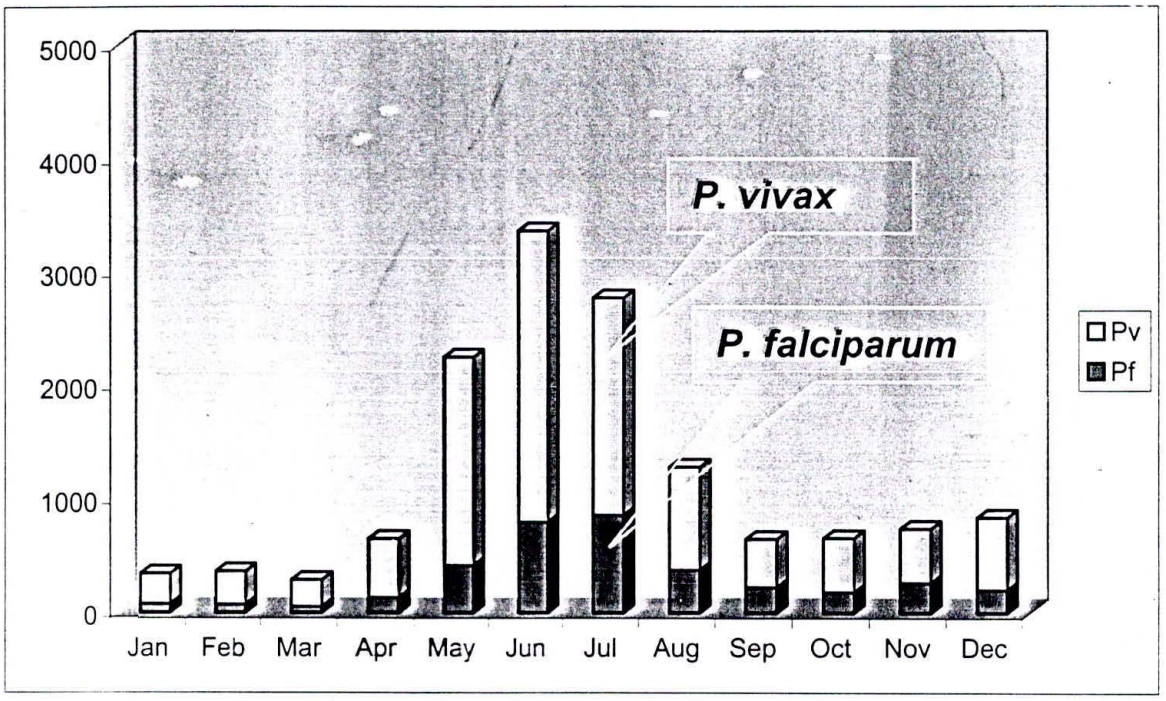
MONTH	BSE	Pv	Pf	Total +ve
Jan	37257	267	80	347
Feb	39620	293	74	367
Mar	40024	237	55	292
Apr	35661	518	136	654
May	53854	1828	419	2247
Jun	91918	2561	799	3360
Jul	69595	1910	860	2770
Aug	71688	902	380	1282
Sep	67517	422	228	650
Oct	45718	475	184	659
Nov	48379	477	266	743
Dec	43285	637	205	932
TOTAL	646654	10526	3770	14296

YEAR 2001 (UP TO AUGUST)

MONTH	BSE	Pv	Pf	Total +ve
Jan	43534	576	208	784
Feb	45207	793	187	980
Mar	48688	1213	467	1680
Apr	54243	2614	639	3253
May	91952	3507	1096	4603
Jun	78991	3211	1067	4278
Jul	72136	1918	990	2908
Aug	57267	1079	564	1643
TOTAL	492018	14911	5218	20129

Figure-4. Month-wise malaria cases in Tumkur district

Year 2000



Year 2001

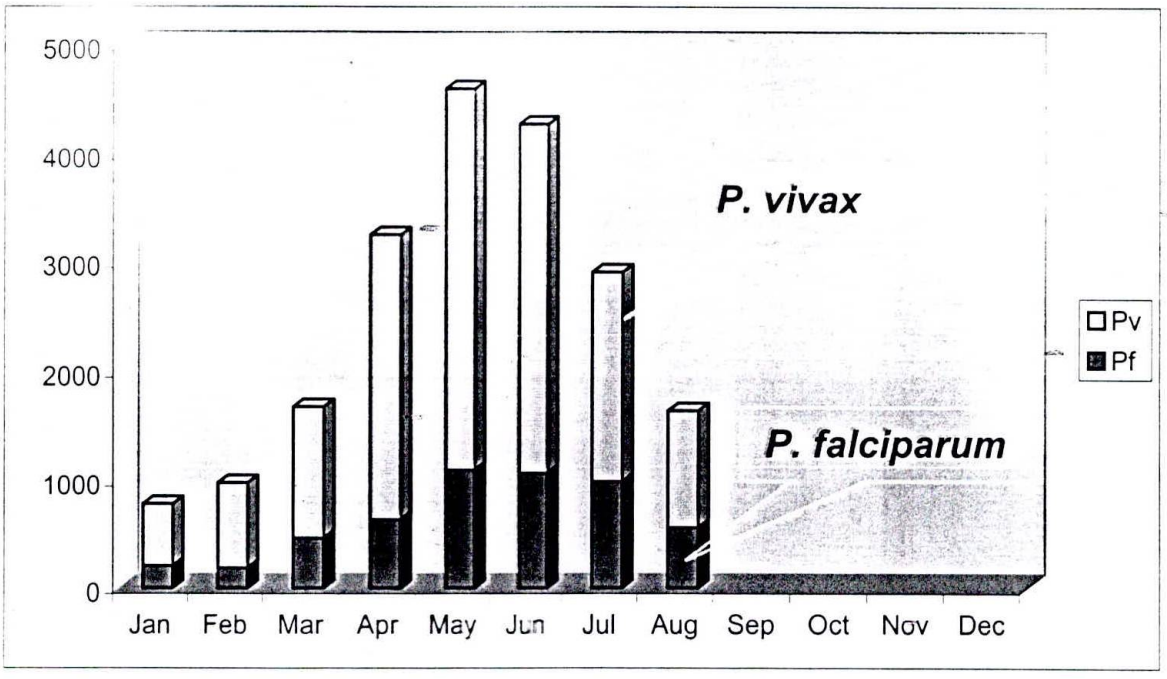


Table-14. Taluk wise Incidence of Malaria
DISTRICT-TUMKUR

YEAR 2000

	Taluk	No of PHCs	Population	BSE	Pv	Pf	total +ve
1	Tumkur	10	284478	71602	804	202	1006
2	Kunigal	8	240833	46961	90	83	173
3	Gubbi	10	253177	72967	771	146	917
4	Thuruvekere	5	171441	52032	645	89	734
5	Tiptur	8	179500	64937	893	281	1274
6	CN Hally	8	214072	113392	2557	1617	4174
7	Sira	8	282586	94050	4128	947	5075
8	Madhugiri	12	245073	48114	66	61	127
9	Pavagada	8	243032	31008	22	6	28
10	Koratagere	6	151879	36709	170	61	231
11	Tumkur-Town	1	200000	14887	371	180	551
	Total		2440059	646654	10550	3746	14296

YEAR 2001 (UP TO AUGUST)

	Taluk	No of PHCs	Population	BSE	Pv	Pf	total +ve
1	Tumkur	10	284478	52493	855	321	1176
2	Kunigal	8	240833	34799	192	74	266
3	Gubbi	10	253177	52425	535	161	696
4	Thuruvekere	5	171441	79724	1222	158	1380
5	Tiptur	8	179500	57245	2089	948	3037
6	CN Hally	8	214072	91446	5302	2106	7408
7	Sira	8	282586	67842	3239	628	3867
8	Madhugiri	12	245073	43495	960	572	1532
9	Pavagada	8	243032	24712	11	4	15
10	Koratagere	6	151879	25655	705	285	990
11	Tumkur-Town	1	200000	8929	397	257	654
	Total		2440059	492020	14982	5218	20200

Table-15. Incidence of Malaria

PHC CN HALLY

YEAR 2000

MONTH	BSE	Pv	Pf	Total +ve
Jan	358	5	1	6
Feb	380	4	0	4
Mar	338	1	4	5
Apr	338	14	7	21
May	1031	104	23	127
Jun	3401	224	116	340
Jul	1619	28	121	149
Aug	1180	20	68	88
Sep	992	4	21	25
Oct	619	10	14	24
Nov	435	6	7	13
Dec	329	5	2	7
TOTAL	11020	425	383	808

YEAR 2001 (UP TO AUGUST)

MONTH	BSE	Pv	Pf	Total +ve
Jan	405	17	13	30
Feb	507	8	1	9
Mar	608	5	1	6
Apr	724	5	3	8
May	1672	28	2	30
Jun	1695	57	5	62
Jul	1133	27	4	31
Aug	882	16	3	19
TOTAL	7626	163	32	195

Table-16. Incidence of Malaria

PHC MATHIGATTA

YEAR 2000

MONTH	BSE	Pv	Pf	Total +ve
Jan	480	3	3	6
Feb	530	0	0	0
Mar	612	4	4	8
Apr	1084	28	22	50
May	2739	159	36	245
Jun	3201	100	67	167
Jul	2310	22	46	68
Aug	1247	0	4	4
Sep	1268	12	10	22
Oct	766	18	7	25
Nov	826	11	13	24
Dec	627	47	25	82
TOTAL	15690	433	314	747

YEAR 2001 (UP TO AUGUST)

MONTH	BSE	Pv	Pf	Total +ve
Jan	1031	63	15	78
Feb	914	48	13	61
Mar	1121	97	9	106
Apr	1551	260	47	307
May	2477	481	153	634
Jun	2388	324	175	499
Jul	1888	156	131	287
Aug	1489	29	39	68
Total	12859	1458	582	2040

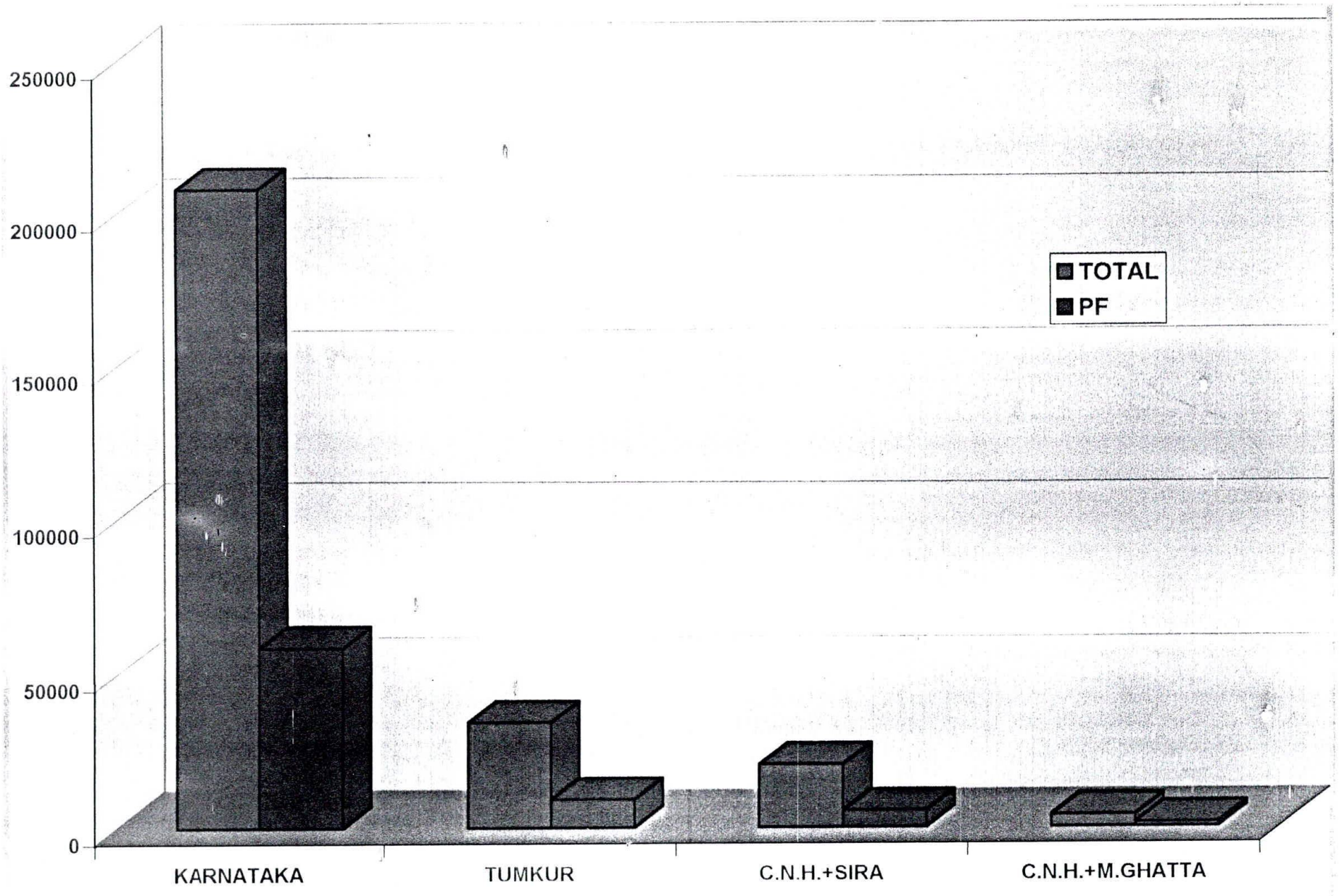

250000
200000
150000
100000
50000
0
TOTAL
PF
KARNATAKA
TUMKUR
C.N.H.+SIRA
C.N.H.+M.GHATTA

Table-17. Incidence of Malaria

PHC- CN Hally

YEAR 2000

	Subcentre	No of villages	Population	BSE	Pv	Pf	total +ve
1	C.N. Hally	Town/	21840	5119	23	20	43
2	Jogihally	10	6136	497	30	8	38
3	Navile	9	3822	915	16	4	20
	Total	19	31798	6531	69	32	101

YEAR 2001 (UP TO AUGUST)

	Subcentre	No of villages	Population	BSE	Pv	Pf	total +ve
1	CN Hally	Urban/Rural	17960	8231	366	309	675
2	Jogi Hally	10	7612	632	15	9	24
3	Navile	9	6643	2571	46	198	244
	Total	19	32215	11434	427	516	943

Population: 4080 (urban), 17760 (C.N. Hally)

Table-18. Incidence of Malaria
PHC- Mathigatta (Taluk- CN Hally)

YEAR 2000

	Subcentre	No of villages	Population	BSE	Pv	Pf	total +ve
1	Mathigatta	9	2560	1482	17	13	30
2	Kamalapura	9	4369	637	20	7	27
3	Soralamavu	10	7161	1054	39	35	74
4	Harernahally	10	5097	1273	31	30	61
5	Hosahally	5	1614	479	52	34	86
6	Gubehally	7	4093	2478	5	19	24
7	Belaguli	4	3359	807	33	13	46
	Total	54	28253	8210	197	151	348

YEAR 2001 (UP TO AUGUST)

	Subcentre	No of villages	Population	BSE	Pv	Pf	total +ve
1	Mathigatta	9	3230	802	244	108	352
2	Kamalapura	9	4271	1362	321	169	490
3	Soralamava	10	4237	1592	100	61	161
4	Harernahally	10	5000	1877	285	107	392
5	Hosahally	5	4440	687	56	27	83
6	Gubehally	7	3728	1003	334	104	483
7	Belagully	4	1924	97	8	1	9
	Total	54	26830	7420	1348	577	1970

Table-19.Malaria prevalence in study villages of PHC Mathigatta (Taluk CN Hally, district Tumkur), January-August 2001.

Villages	*Popul-ation*	*Period*	*Surveillance agency*	*BSE*	*Pv*	*Pf*	*Total*	*SPR (%)*	*SfR*
Passive surveillance									
Mathigatta PHC hospital		31.8.01	MRC*	10	1	5	6	60.00	50.00
Active surveillance									
Kamalapura	959	Jan-Aug'01	NAMP	443	106	62	168	37.92	13.99
		31.8.01	MRC*	**84**	2	29	31	36.91	34.52
Kamalapura Gotahatti	164	Jan-Aug'01	NAMP	160	42	21	63	39.37	13.12
		31.8.01	MRC*	**35**	1	10	11	31.43	28.57
Hosure	692	Jan-Aug'01	NAMP	119	34	32	66	55.46	26.89
		31.8.01	MRC*	**75**	2	14	16	21.33	18.67
Surgan hally Vaddarhatti	School	31.8.01	MRC*	24	0	8	8	33.33	33.33
Bagur		31.8.01	MRC*	58	1	4	5	8.62	6.90

- point prevalence study

Table-20. Result of cross examination of blood smear

Source of blood smear	No. of slides	Examined by	Cross-examination result				
			PfR	PfrG	Pfg	Pv	Total
PHC C.N. Hally	100	PHC	0	0	0	0	0
		MRC	7	4	0	2	13
	50	PHC	0	0	24	26	50
		MRC	0	7	17	26	50
PHC Mathigatta	200	PHC	0	0	0	0	0
		MRC	5	0	0	0	5
	100	PHC	0	0	49	51	100
		MRC	0	0	49	51	100

Table-21. Drug sensitivity test in *P falciparum* against Chloroquine

(Mathigatta PHC, Taluk CN Hally)

Code	*Date of first dose of CQ administration*	*Blood examination result*				
		Day 0	Day 1	Day 2	Day 3	Day 7
KG1	31.08.01	PfRG	PfG	PfG	PfG	PfG
KG3	31.08.01	PfR	Neg	Neg	Neg	Neg
KG15	31.08.01	PfR	Neg	Neg	Neg	Neg
KG18	31.08.01	PfR	Neg	Neg	Neg	Neg
KG21	31.08.01	PfR	Neg	Neg	Neg	Absent
KG24	31.08.01	PfR	Neg	Neg	Neg	Neg
KG27	31.08.01	PfRG	PfG	PfG	PfG	PfG
KG28	31.08.01	PfR	Neg	Neg	Neg	Neg
KG35	31 .08.01	PfRG	PfG	PfG	PfG	Absent
Mathigatta 1664	31.08.01	PfR	Absent	PfG	PfG	Absent
SV1	31.08.01	PfRG	PfG	PfG	PfG	PfG
SV2	31.08.01	PfR	Neg	Neg	Neg	neg
SV3	31.08.01	PfR	Neg	Neg	Neg	neg
SV4	31.08.01	PfRG	PfG	PfG	PfG	PfG
SV6	31.08.01	PfRG	PfG	PfG	PfG	Absent
SV8	31.08.01	PfRG	PfG	PfG	PfG	PfG
SV13	31.08.01	PfR	PfG	PfG	PfG	PfG

KG= Kamalapur Gallarahatti

SV= Suregehally Vaddarhatti

Table-22: Anopheline density in study villages

Village	Subcentre	*An culicifacies*						*An.fluviatilis*		*An. subpictus*		*An. annularis*		*An pallidus*		*An vagus*		Total	
		UF	FF	SG	G	Total	MHD	Total	MHD	Total	MHD	Total	MHD	Total	MHD	Total	MHD	Total	MHD
PHC HULIYAR																			
Ballekatte Thanda	Maruth Nagara	2	1	10	7	20	13.30	0	0.00	78	52.00	0	0.00	0	0.00	0	0.00	98	65.33
Ballekatte	Maruth Nagara	0	1	6	2	9	3.00	0	0.00	140	46.67	2	0.67	1	0.33	0	0.00	152	50.67
Kankere	Kankere	0	0	0	1	1	1.00	0	0.00	56	56.00	0	0.00	0	0.00	0	0.00	57	57.00
Kurehatty	Kankere	0	0	1	0	1	1.00	0	0.00	88	88.00	0	0.00	0	0.00	0	0.00	89	89.00
Gowdagere	Kankere	0	0	0	0	0	0.00	0	0.00	154	154.00	0	0.00	0	0.00	1	1.00	155	155.00
Total		2	2	17	10	31	4.13	0	0.00	516	68.80	2	0.27	1	0.13	1	0.13	551	73.47
PHC MATHIGATTA																			
Segabage	Hosahally	0	0	6	8	14	14.00	0	0.00	7	7.00	1	1.00	0	0.00	0	0.00	22	22.00
Kamalapura	Kamalapura	7	0	6	12	25	25.00	1	1.00	10	10.00	0	0.00	0	0.00	0	0.00	36	36.00
Laxmipura	Hornahally	0	0	2	8	10	10.00	0	0.00	75	75.00	0	0.00	0	0.00	0	0.00	85	85.00
Gopalpura	Hornahally	1	0	1	3	5	5.00	0	0.00	166	166.00	0	0.00	0	0.00	0	0.00	171	171.00
Bergur	Belaguli	1	0	2	0	3	3.00	0	0.00	18	18.00	0	0.00	0	0.00	0	0.00	21	21.00
Otikere	Belaguli	1	0	2	0	3	3.00	0	0.00	26	26.00	0	0.00	0	0.00	0	0.00	29	29.00
Mathigatta	Mathigatta	3	4	13	11	31	15.50	0	0.00	48	24.00	0	0.00	0	0.00	0	0.00	79	39.50
Total		13	4	32	42	91	11.25	1	0.13	350	43.75	1	0.13	0	0.00	0	0.00	443	55.38
PHC DASUDI																			
Ballapanahatty	Dasudi	0	0	0	0	0	0.00	0	0.00	47	47.00	0	0.00	0	0.00	0	0.00	47	47.00
Bullenhatty	Dasudi	0	0	0	0	0	0.00	0	0.00	23	23.00	0	0.00	0	0.00	0	0.00	23	23.00
Total		0	0	0	0	0	0.00	0	0.00	70	35.00	0	0.00	0	0.00	0	0.00	70	35.00

Table-23: Insecticide spray history in Tumkur district (2000-2001)

Taluk	PHC	Insecticides used (rounds) 2000	2001
Gubbi	Hosakere	DDT (2)	DDT (2)
	Doddachangavi	DDT (2)	DDT (1)
	Kadaba	DDT (1)	
	Nithur	Deltamethrin (2)	
	Chelur	Deltamethrin (2)	
Kunigal	Yedavani	DDT (1)	
Turuvekere	Mayasandra	DDT (2)	DDT (2)
	Turuvekere	Deltamethrin (2)	
	Banasandra	Deltamethrin (2) OR DDT (2)	DDT (2)
	Dandinashivara	DDT (2)	DDT (2)
	Mavinakere	DDT (2)	DDT (2)
Sira	Sira	DDT (2) Deltamethrin (S)	Malathion (2)
	Bukkapatna	DDT (2) Deltamethrin (S)	Malathion (2)
	Thavarekere	DDT (2) Deltamethrin (S)	Malathion (2)
	Pattanayakanhalli		DDT (1)
Koratagere	Thovinakere	DDT (1)	DDT (2)
C N Hally	Handankere	DDT (2) Deltamethrin (S)	DDT (2) Malathion (S)
	C N Hally	Deltamethrin (2)	Deltamethrin (S)
	Huliyar	Deltamethrin (2)	Deltamethrin (S)
	Mathigatta	Deltamethrin (2+S)	Deltamethrin (S)
	Kandikere	Deltamethrin (2+S)	Deltamethrin (S)
	Dasudi	Deltamethrin (2)	Deltamethrin (S) Malathion (1)
	Sattikere	Deltamethrin (S)	
	Thimmanahally	DDT (2)	DDT (1)
Tumkur	Kyathsandra	DDT (2) Deltamethrin (S)	
	Ramagondanhally		DDT (2)
	Bellavi		DDT (2)
Tiptur	Honnavalli	Deltamethrin (2)	Deltamethrin (S)
Madhugiri	Badavanahally		DDT (1)
	Midigeshi		Malathion (S)
	I D Hally		Malathion (S)

S= Special round

Table-24. Staff Position and Vacancy

(District Tumkur, Karnataka)

Name of the Taluka (No. of PHC)*	Senior Health Assistant		Junior Health Assistant		Lab. Technician	
	Sanctioned	Vacant	Sanctioned	Vacant	Sanctioned	Vacant
Tumkur (9)	6	0	38	10	9	3
Kunigal (8)	5	2	43	23	8	2
Gubbi (10)	4	0	38	22	10	1
Turuvekera (5)	4	1	26	8	5	2
Tiptur (8)	3	0	32	10	8	3
C.N. Halli (8)	4	2	29	14	8	6
Sira (8)	6	3	48	28	8	6
Madhugiri (12)	4	1	49	35	12	5
Pavagada (7)	4	4	35	23	7	2
Koratagere (6)	3	0	26	15	5	2
Total 10 (81)	43	13	364	188	80	32

*** Malaria Reporting PHCs - 81 (Total PHC – 93)**

Table-25. Training Required For Health Functionaries

(TUMKUR DISTRICT, KARNATAKA)

S.NO	POSITION	SANCTIONED	IN POSITION	TRAINING STATUS
1	DMO	1	1	Trained
2	Medical Officers	93	79	To be Trained
3	Malaria Inspectors	7	7	To be Trained
4	Senior Health Inspectors	43	31	Trained
5	Junior Health Inspectors	360	177	To be Trained
6	Lab Technicians	81	49	40 To be Trained
7	Auxillary Nurse and Midwife	555	555	To be Trained
8	Mahila Swathiya Sangha (MSS)	345	345	To be Trained

Partnership and Linkages

Two workshops were organized to identify partners to be involved under Roll Back Malaria initiative. One workshop was held at district headquarters Tumkur on 3rd September 2001, another at Taluk C. N. Hally of district Tumkur on 7th September 2001. Representatives of various non-government organizations, government sectors, private sectors and community attended the workshops. The target sectors were:

- Health Department
- Non-Government Volunteer Organizations (NGOs)
- Private Health Care Providers
- Non-Health Government Sector
- Education Departments
- Community Representatives- MP/MLA/Village President

The objectives of these workshops were to interact with different groups and get their opinion for their active partnership in formulating malaria action plan.

A. Workshop at Tumkur

The workshops was organized by MRC and NAMP with the help of District Health Office, Tumkur on 3rd September 20001 at IMA Hall, Tumkur. A total of 90 participants from various sectors attended the workshop. Among important person following were present

1. Shri T. B. Jayachandra, Honourable Minister, Agriculture, Karnataka Government and District Minister, Tumkur
2. Shri S. Shivanna, MLA, Tumkur
3. Dr. M. V. Murungendrappa, Additional Director (Health Services), Government of Karnataka
4. Dr. Chikka Basavaiah, District Health and Family Welfare Officer (DHO), Tumkur
5. Dr. S. Siddagangaiah, District Malaria Officer, Tumkur
6. Dr. Ravi Narayan, President, Community Health Cell, Bangalore
7. Dr. T. Adak, Dy Director, MRC, Delhi.

Shri S. Shivanna inaugurated the workshop. Later Honourable minister Shri T. B. Jayachandra joined the workshop.

To work out the strategies for building partnership with various sector under Roll Back Malaria initiative under local need and situations, the participants were divided into three

groups, each group came out with recommendations after group discussion. Group leaders of each groups presented the outcome of discussion and their recommendation.

Recommendations of Working Groups:

Group 1. Govt. health officials, NGOs and Education

Group Leader: Shri N. K. Yetiraj, President, Tunkur Science Forum, Tumkur

Rapporteur: Dr. Rajan Patil, Community Health Cell, Bangalore

A total of 25 representatives from volunteer organizations and education department participated group discussion. The outcome recommendations of the group are as follows:

A. Involvement of volunteer organizations

Partners in Programme:

1. Broader and separate meetings of NGOs should be organized for effective planning and implementation.
2. Various voluntary organization such as Stri Shakti/Yuva Sanghas/Self Help groups / Mahila Sanghas groups may be involved in the programme implementation.

Strategies for IEC:

Through Gram Sabha, Kalajathas. slide/video/film shows, popular science lectures. wall writing, poster and charts etc

Development of Infrastructure

1. Shop keepers / disabled people from community may be identified for establishment of
   - Fever Treatment Depot (FTD)
   - Drug Distribution Centre (DDC)
2. Village level Health Committee may be established. activated if already present.

B. Involvement of education system

1. Cluster level training meeting

Tumkur District Education structure is divided into clusters. Each cluster covering schools (both govt and private) in two panchayat area. There are about 28 panchayats in CN Halli, hence 14 clusters. Each cluster covers bout 50 teachers who meet bi-monthly. The malaria could be introduced in these meetings.

Samudaya Shale :

This programme is initiated by the Deputy director, Public Instruction Department. Under this scheme the school is supposed to organize community meetings in the

school campus. The basic objective of this scheme is to keep the community informed about the progress of the children studying in the school and developments in the school. This scheme has been a failure, since the turnout in these meetings was very meager. The department changed the frequency from monthly to once in three months. In the group discussion it was felt that this scheme could be made more interesting if the issues concerning community are taken up in the meeting rather than just restricting these meeting to progress of students and schools. Malaria could be starting point in these meetings.

2. School and community meetings must be used to create awareness.
3. Resource persons to be identified motivated and trained to conduct awareness programme. Forced, circular work will not work.
4. Inter-linkage with various departments and forums such as Revenue, Gram Panchayat, Health, Agriculture, Horticulture, Women and Child Welfare, Nehru Yuvaka Kendra, Mahila Sangha, Yuvaka Shangha etc. should be established.
5. Peoples' representative should also be involved for sustained movement.

Group 2. Government Health/Non-Health Officials

Group Leader: Dr. P. R. Chidananda, Taluk Health Officer, CN Hally

Rapporteur : Mr. T. R. Raghunatha Rao, Ex-Dy Director-General, ICMR

The group consisted of government medical officers and paramedical staff and officials from other government department. A total of 21 participants attended the workshop. The group discussed the reasons of malaria endemicity in Tumkur. The reasons identified and their recommendations were as follows:

A. Technical

1. Many cases are migratory and no mechanism exists to monitor, treatment and follow up them. More often the patients give incomplete address and it is difficult to follow them up for RT.
2. Very often patients by-pass the physicians and approach Chemists directly for medicines, this has often lead to incomplete treatment of malaria and thereby drug resistance. This type of OTC dispensing of drugs should be prevented by enacting laws.
3. Some of the private practitioner of traditional medicine and quacks give wrong treatment. They must be educated about national drug policy of malaria treatment.
4. Even in government hospitals, supply of antimalarials is irregular, insufficient and erratic which are to be urgently addressed.
5. Laboratory facilities are inadequate. Technicians are newly appointed and need training. Microscopes need periodic servicing and 5X eyepieces to be replaced with 10X. Quality of blood smear and staining is to be improved.
6. Incentive is to be given to efficient technicians.
7. Active surveillance should be strengthened by appointing existing vacancies.

8. Adequate transport and provision for POL should be made available for carrying out effective active surveillance
9. Malaria programme should be treated at par with other programme for the purpose of TA/DA.
10. There is not enough administrative power to DHO/THOs for effective management of malaria activity, this need to be addressed.
11. A uniform national drug policy should be enforced on the GPs and nursing homes.

B. Community Participation and Intersectoral Coordination

1. Elected members of district should meet periodically to assess the situation. Under their guidance government departments should come together to do their part of duty towards malaria control
2. GPs and private nursing home people should also be involved in such meetings.

Group 3. Private health care providers

A total of 35 participants from health care providers such as private health practitioners, dispensaries, diagnostic laboratories attended the meeting. Some government health officials were also present in the group. The group's recommendations are as follows

1. The group strongly recommended the partnership of general health practitioners, dispensaries, diagnostic laboratories, and shopkeepers.
2. The group realized need of stronger interaction between government health agency and private health care provider for effective malaria control.
    a. The health implementing agencies should provide information about latest national drug policy to the private practitioner.
    b. The government should make educational materials available to local practitioners for rational and scientific treatment.
3. The private practitioner may contribute to solve the malaria problem by educating their patients about.
    a. The necessity of complete treatment for malaria treatment to avoid recrudescence and drug resistance.
    b. Educating the patients about how to prevent themselves from malaria.
    c. Suggest to patient for report to hospital in case of any fever.
4. The private practitioner should report of their finding to local health agency about
    a. Malaria cases detected in their clinic
    b. Drug resistance
    c. Occurrence of epidemic noticed
5. The private practitioners should recommend the patients for blood smear examination for rational treatment

6. In case GPs does not have diagnostic facilities with them, government diagnostic facilities available at periphery may be utilized for blood smear examination of their patients
7. It was observed by private diagnostic laboratories that some patients get their blood examined without consulting physicians, in such cases patients should be advised to consult physicians for correct treatment and should educate about consequences of wrong treatment.
8. Treatment of malaria on the basis of merely clinical feature should be discouraged. Proper radical treatment should be ensured following blood smear examination.

B. Workshop at CN Hally

Another workshop was organized in C. N. Hally of district Tumkur by MRC and NAMP with the help of Taluk Health Office, C. N. Hally on 7th September 20001 at Ambedakar Bhawan. A total of 92 participants from various sectors attended the workshop. Among important person following were present

1. Shri Suershbabu, MLA, Karnataka
2. Mrs. Draksayini, President, Zila Panchayat, Tumkur
3. Dr. Ravi Kumar, Chief Health Officer, Regional Directorate of Health & Family Welfare, Bangalore
4. Dr. S. Siddagangaiah, District Malaria Officer, Tumkur
5. Dr. C. Mahadev, Taluk Health Officer, C. N. Hally
6. Dr. T. Adak, Dy Director, MRC

Shri Suershbabu, MLA Karnataka, inaugurated the workshop. Mrs. Draksayini, President, Zila Panchayat, Tumkur, was the Chief Guest.

To work out the strategies for building partnership with various sector under Roll Back Malaria initiative under local need and situations, the participants divided into three groups and discussed. Group leaders of each groups then presented the outcome of discussion and their recommendation.

Recommendations of Working Groups:

Following recommendations were come out from various groups. The recommendations originally were in local language, which was transcript by Shri T. R. Rghunatha Rao.

Group I NGOs

Facilitator; Shri A. Prahlad, CHC, Bangalore

A. Community understanding on Malaria:

The group felt that community need health education about the malaria particularly about their cause, measure of prevention and role of community in malaria control.

There exists lack of community cooperation in control of malaria and knowledge about malaria that is to be motivated.

B. Participation as partners in Malaria control

1. Getting organized
2. Awareness camps
3. Cooperating with village panchayats
4. Formation of informal health committees
5. Involving other likeminded association
6. Cooperating with local Midwives/Nurses etc.
7. Cooperating with local health workers
8. Cooperating with Anganwadi workers
9. Involving School Teachers
10. Utilising available media
11. Establishing malaria screeing center
12. Appointing village health workers
13. Undertaking appropriate malaria control programme at right time

C. Establishing link with community vs. Govt and vice - versa

Establishing Links with NGOs Vs Govt

1. Efforts to get Govt policy changed to control malaria through intersectoral cooperation
2. Establish healthy relation with village panchayat
3. Strive for effective style of malaria control work by Govt agencies
4. Strive for village level malaria control programme policy
5. Have village health committee
6. Through School committees
7. Conducting PRA activities
8. Through Anganwaadi workers
9. Utilize health workers
10. Through Self Help groups
11. Village
12. Publicity through Information Centres
13. Training elected Taluk & Village officers
14. Establishing pressure groups in the community.

Group II School Teachers /Science Forum/Clubs/Chemists

1. The students are most potential target group for health education. For effective health education there is need of training of school teachers.
2. For proper health education school teachers should be trained on malaria through Zonal Resource Centre.
3. The Physical Culture Teachers. which are 88 in numbers in C.N. Hally taluk, should be trained in their monthly meetings.

4. The high-school teachers, specially science teachers, should be trained through Taluk Science Forum.
5. The school teachers and students should collectively undertake village sanitary work.
6. Continuous malaria information centre may be established in community.
7. The services of 'Kalajatha', a successful mode of street plays, can be taken for imparting health messages in community.
8. The clubs such as Rotary Clubs may encourage the community, group or organization for such work by awarding prize.
9. It was advised that Chikkanayaka Youth Club should conduct seminar on malaria under the leadership of Dr. H. Sudashan, Chairman, Karnataka Health Task Force.

Group- III: Govt. Health Workers

Number of participants:13

1. **Staff pattern** – Earlier one male and one female worker used to take care of 3 to 5 thousand population, but now they have to cater 8 to 10,000 persons, In addition Junior and Senior workers have pressure work of other responsibilities. All these has resulted in improper work. The REASON is posts that are vacant for over 10 years remain unfilled. These posts should be filled immediately for effective malaria control.

2. In malaria control Sr. health workers responsibility is great, but in the newly created PHCs Sr. Health workers Post has not been sanctioned. This should be done soon and posts filled u p.

3. **Quick case finding and PT** – To fulfill this each and every Health Centre should have a Malaria Laboratory suitable staffed.

4. **Immediate Treatment of fever cases** – Although Sr. Health Worker is supposed to take care of this activity, it is Jr. H.W. who has been asked to do this at the cost of surveillance work. When he does this along with other National Programme entrusted to him, naturally certain technical deficiencies crop-in. Like Leprosy treatment, giving antimalarials in Capsule form of increased strength (bringing down quantity of tablets) may be tried.

5. Health workers in Malaria has been denied regular TA & DA from 1996, where as other programme workers get it. This has caused heartburns and demoralized staff;. Therefore this may be restored and transport facility given.

6. **Insecticides** – There is public apathy & non-cooperation to insecticide spraying. The reason is insecticides like DDT, BHC & Malathion odour and colour is

disliked by the community. They demand and insist either ICON Or Solfac insecticide be sprayed. This has resulted in no spray in households, but they insists spraying in cattleshed also.

7. In addition there must be unform insecticide (same insecticide) spraying in the whole taluk. For this purpose, firstly this activity should be done simultaneously in whole taluk, secondly the daily wages given by the Govt. is far less than outside resulting in no workers for the activity. Therefore daily wages should be increased.

8. **Village Sanitation/ Cleanliness** – In this regard Health workers need the whole hearted cooperation of Village Panchayat and the Community.

9. Due to the very special style of malaria treatment in Private Nursing Homes many cases are not recorded (more than half). But since the treatment is more often non malaria specific malaria problem is getting complicated.

10. There is an immediate need for truthful health education about malaria in the community. This should be given top priority.

11. Printed registers for records maintenance are not available. As a result valuable data is scanty/ unavailable.

12. Human and effective supervision will increase efficiency at lower levels.

13. To enable Health workers to do their work more efficiently interest free loans may be given to buy Two-wheelers.

14. Health workers daily handle blood contaminated needles and syringes, therefore these workers may be immunized against Hepatitis B and other diseases freely.

15. Community feels Govt. given antimalarials are of low quality and efficiency, therefore quality of antimalarials may please be improved.

Group IV Govt. PHC Doctors

Number of participants: 20
Facilitator; T.R. Raghunatha Rao.
Group Leader; Dr. B.V. Channabasavaiah, Medical Officer, Tiptur.

1. Improve – Infrastructure

   - Staff Vacancies (Man-power development)
   - Active surveillance (Early diagnosis & Treatment)

2. Good transport facilities

3. Give – Continuing Medical Education particularly on Malaria in this sector so also appropriate courses to Sr. Health Workers (M&F).

4. Provide Good Health Education (Print & Electronic media)

5. Bring G. Ps, Private practitioners under control particularly for national programmes. Prevent misuse of drugs.

6. Do Timely insecticide spray at a TIME especially in border districts also and introduce biological control methods.

7. Change in Hospital working hours-bring it 9 a.m. to 4 p.m. this enables more patient care including lab service.

8. Give uninterrupted supply of medicines, Slides, Lancet and Stains.

9. Appoint good well trained Lab Technicians.

10. Provide good Supervisory staff.

We do well implementation of programme.

Comments:-

1. Among 20 doctors of the group 6 were from the neighbouring districts. They as well as Tumkur district (CN Hally) doctors were of the opinion that it is a great problem to locate patients. Reason is often they belong to other district although they come to nearby PHCs. This has resulted in statistics of a district distorted. Therefore they suggest that for atleast for malaria control PHCs coming under the boundary areas be formed under one umbrella of administrative control. This will yield more positive result in the control of malaria.

2. When PHC doctors are posted from no-problem area to problem area like CN Hally, doctors should be given orientation as to the nature and depth of problems therein. In fact one of the doctors did confess that when he was transferred to CN Hally recently, his knowledge of malaria was insufficient.

3. Therefore all the doctors felt that they should get Continuing Medical Education from competent persons preferably MRC/NAMP at least once in 3 years.

4. Similarly Laboratory Technicians too should get refresher courses to keep their skills sharp.

5. When their attention was brought to the malaria teaching programme produced by MRC, they had no information about it. They said, it should be loaned these tapes by the Jt. Director for viewing and educating themselves and other workers.

6. In one voice they said 'How a medical officer is responsible for a case of death if the patient did not come to them'? Unfortunately elected representatives of all levels hold them responsible and victimize them. This should stop.

7. Regarding Antimalarials supply, all of them said, always it is short supplied. When it is needed it is not there. For eg. if 2000 primaquine is indented they get 500 only. How they can do RT?

8. Continuing on antimalarials, patients feel bad at the large number of tablets (Chloroquine & Primaquine) they have to swallow. Can it not be reduced by capsuling them? Similarly adult and pediatric tablets should be supplied to make dispensing easy.

9. They ask, when GPs and Nursing Home prescribe and administer latest antimalarials like emol. why Govt. still persists in Chloroquine? Although it is very well known that drug resistance is of the order of 40%. Why not Govt. also does the same and control malaria.

10. If the above is not possible, let there be a National antimalarial drug policy. Every one Govt. & non-Govt. Private, GPs enforced to follow it.

11. Let malaria control be responsibility of all concerned departments of the Govt. Like PWD, Fisheries. Forestry, House building etc. Enforce intersectoral coordination and cooperation.

12. For insecticidal spraying actually there is no money to lift these and do spraying. Also it has to be done when needed not when the Govt. gets the stock. There is no planning in advance.

13. Existing timings of PHCs hamper patient care. In villages people come between 9 am to 3 pm, at that time Lab is not working. Therefore for maximizing patient care in one visit Change it to 9 am to 4 pm.

14. Slides supplied are of not good quality, this results in improper smear taking and diagnosis. Do supply good quality slide and on time. Also there is need to increase technicians strength at least during these epidemic times. This will enable early diagnosis and proper treatment.

15. Genuine problems of Health Workers like filling up of vacant posts, posts due to retirement, posts in newly created PHCs should be attended to. From 1996 TA & DA of these staff are withdrawn. Therefore put malaria workers on par with other National Programmes for TA & DA.

16. There is no Health Education worth its name. To bring about effective community participation, introduce health education extensively and intensively.

17. Even PHC doctors does not have transport how can he treat positive cases scattered in over 8 to villages, even Pf cases get ignored. There is no transport to bring slide smears from over 100 Kms.

18. Stop political and other interference in transfers, reporting to duty even on deputation etc.

19. Finally doctors were of the view if many of their problems are solved they will be too happy to implement and control malaria. The problem persists because it is not addressed to and solved.

Model of Action Plan:

During workshop a voluntary organization (NGO) group, Community Health Cell based at Bangalore, came out with a working model for mobilization of community by involving various government and non-government organizations. An outline of their perceived concept and action plan is given in fig-5.

Plan of action for Dist. – Tumkur

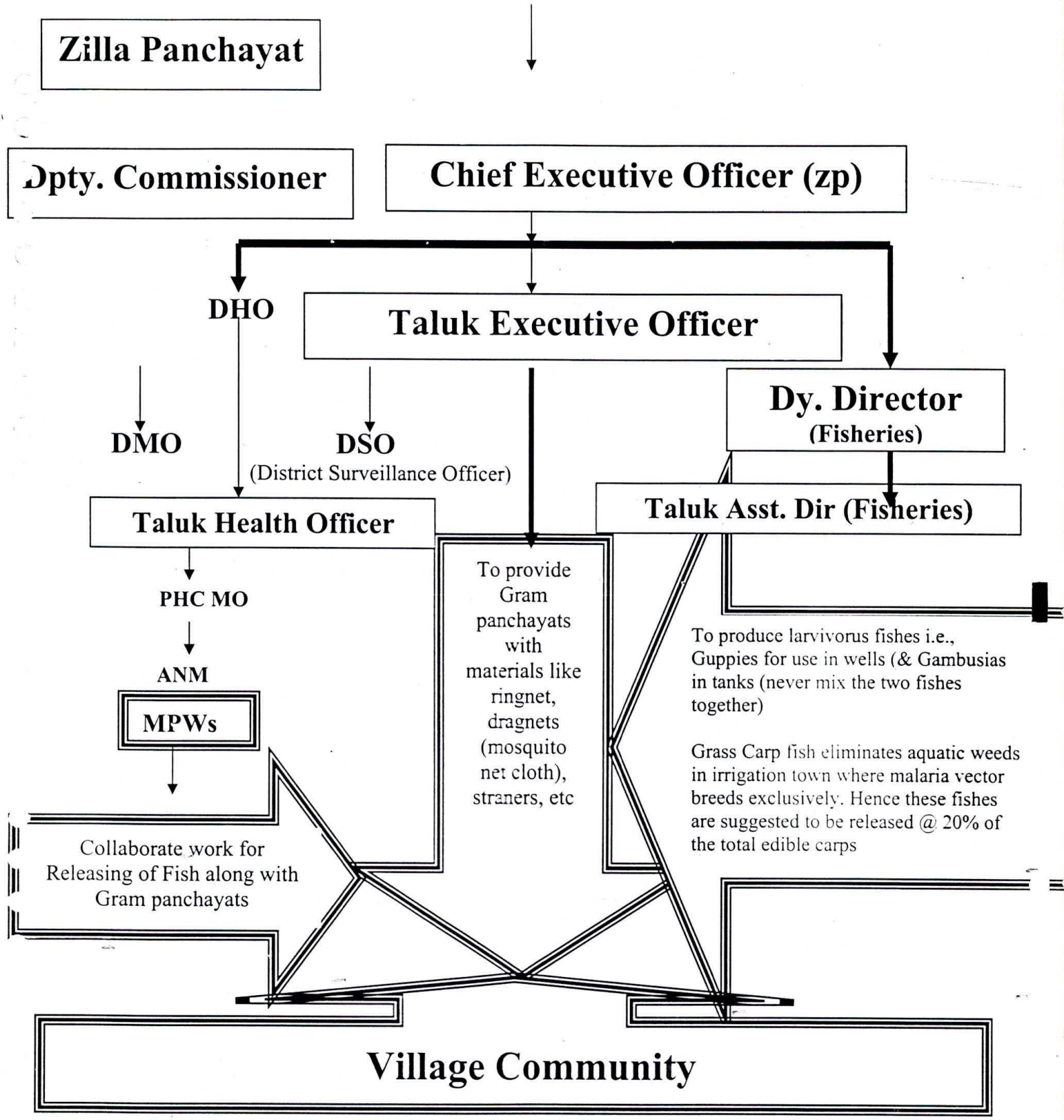


FIG. 5.1

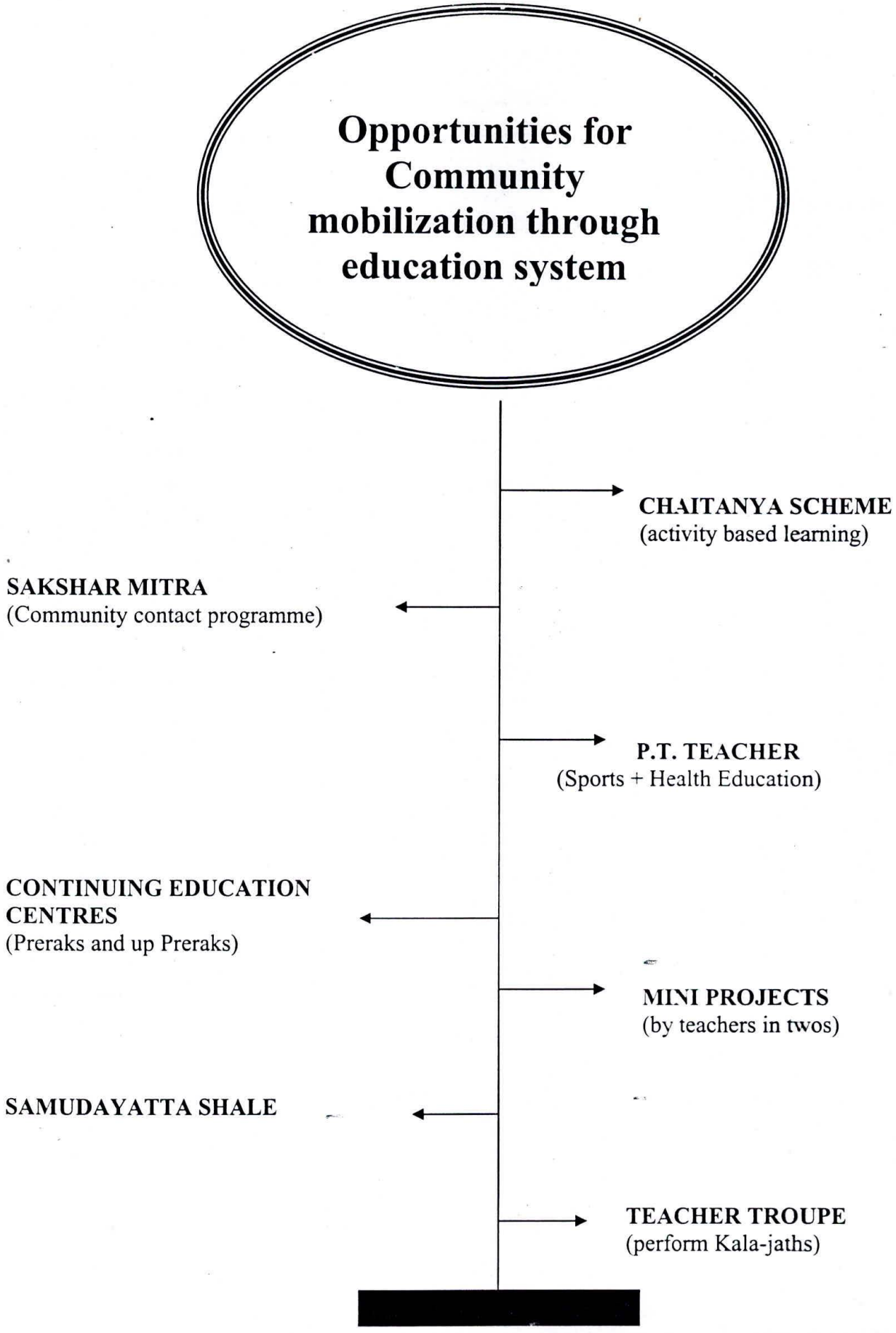

Opportunities for Community mobilization through education system
CHAITANYA SCHEME
(activity based learning)
SAKSHAR MITRA
(Community contact programme)
P.T. TEACHER
(Sports + Health Education)
CONTINUING EDUCATION CENTRES
(Preraks and up Preraks)
MINI PROJECTS
(by teachers in twos)
SAMUDAYATTA SHALE
TEACHER TROUPE
(perform Kala-jaths)

FIG. 5.2

COMMUNITY MOBILIZATION IN CN HALLI

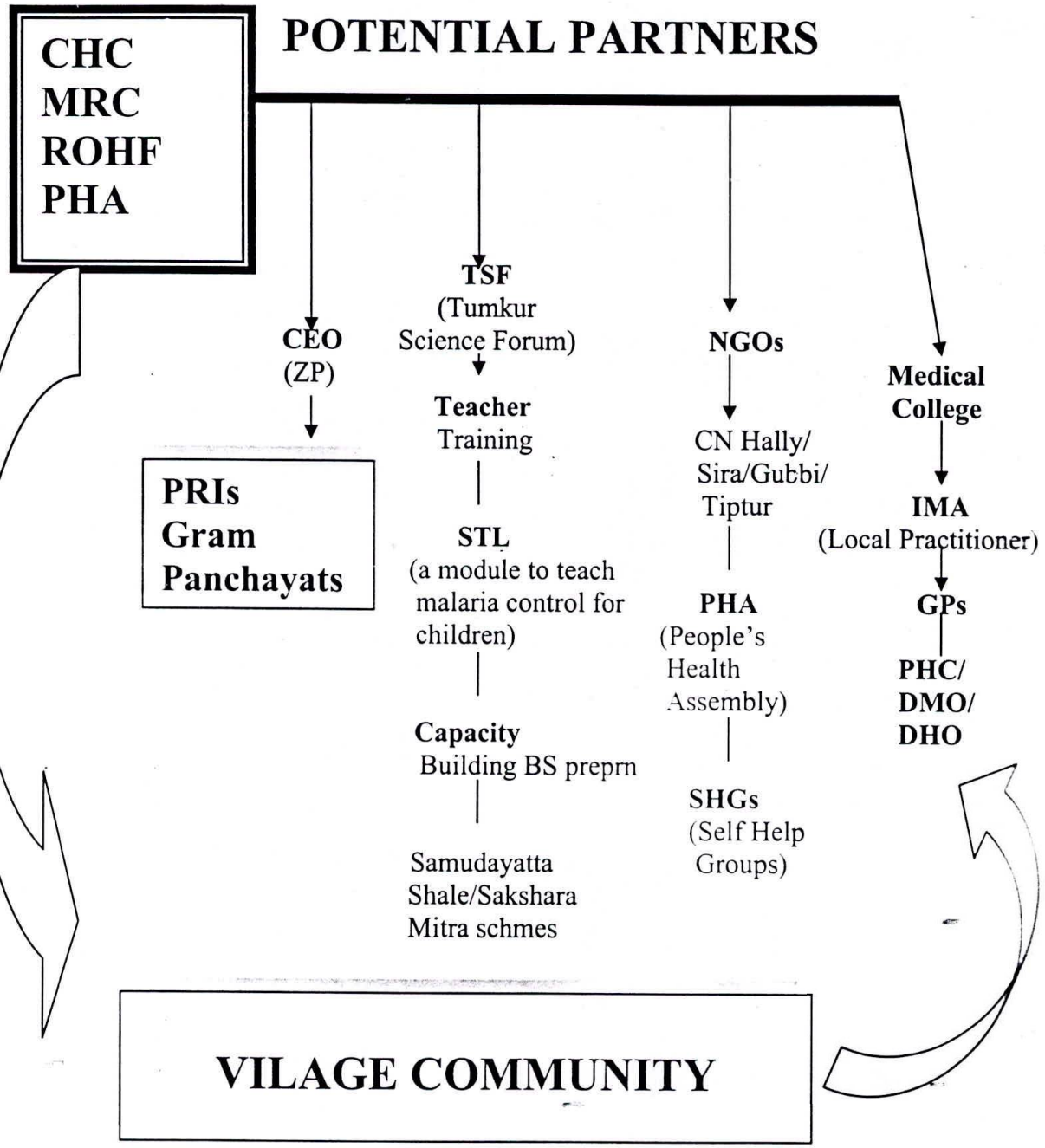


FIG. 5.3

TARGET GROUPS FOR IEC TO MOBILIZE COMMUNITY IN CN HALLI

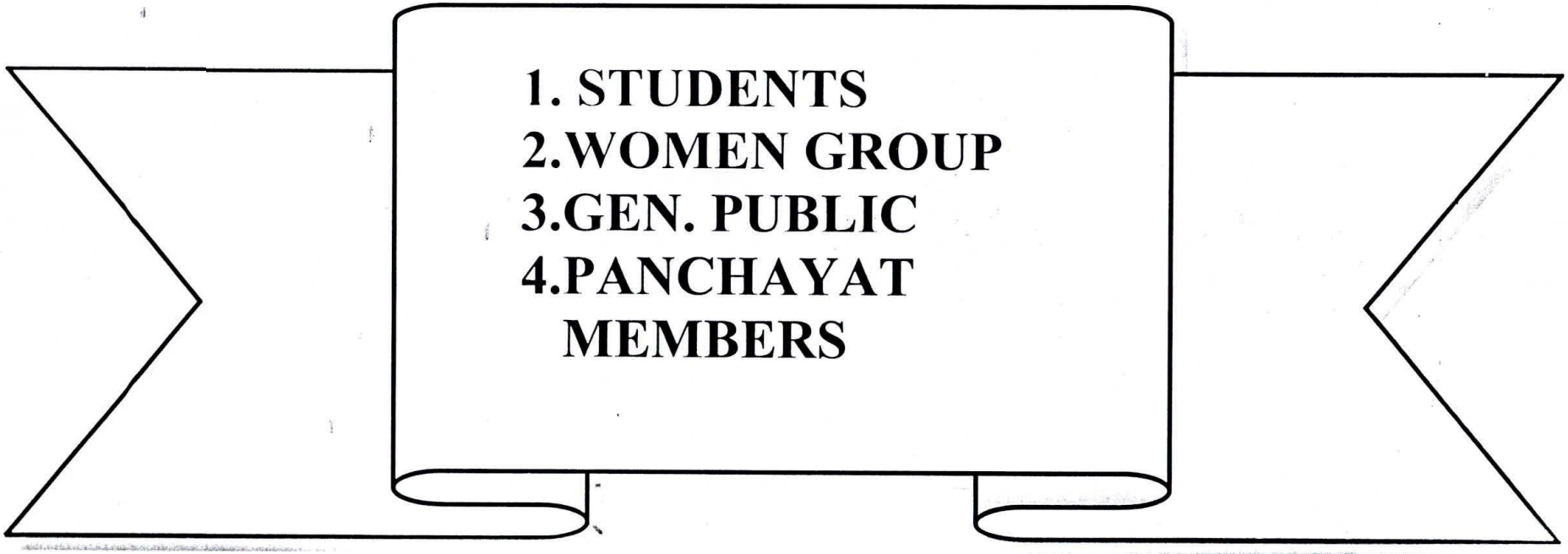
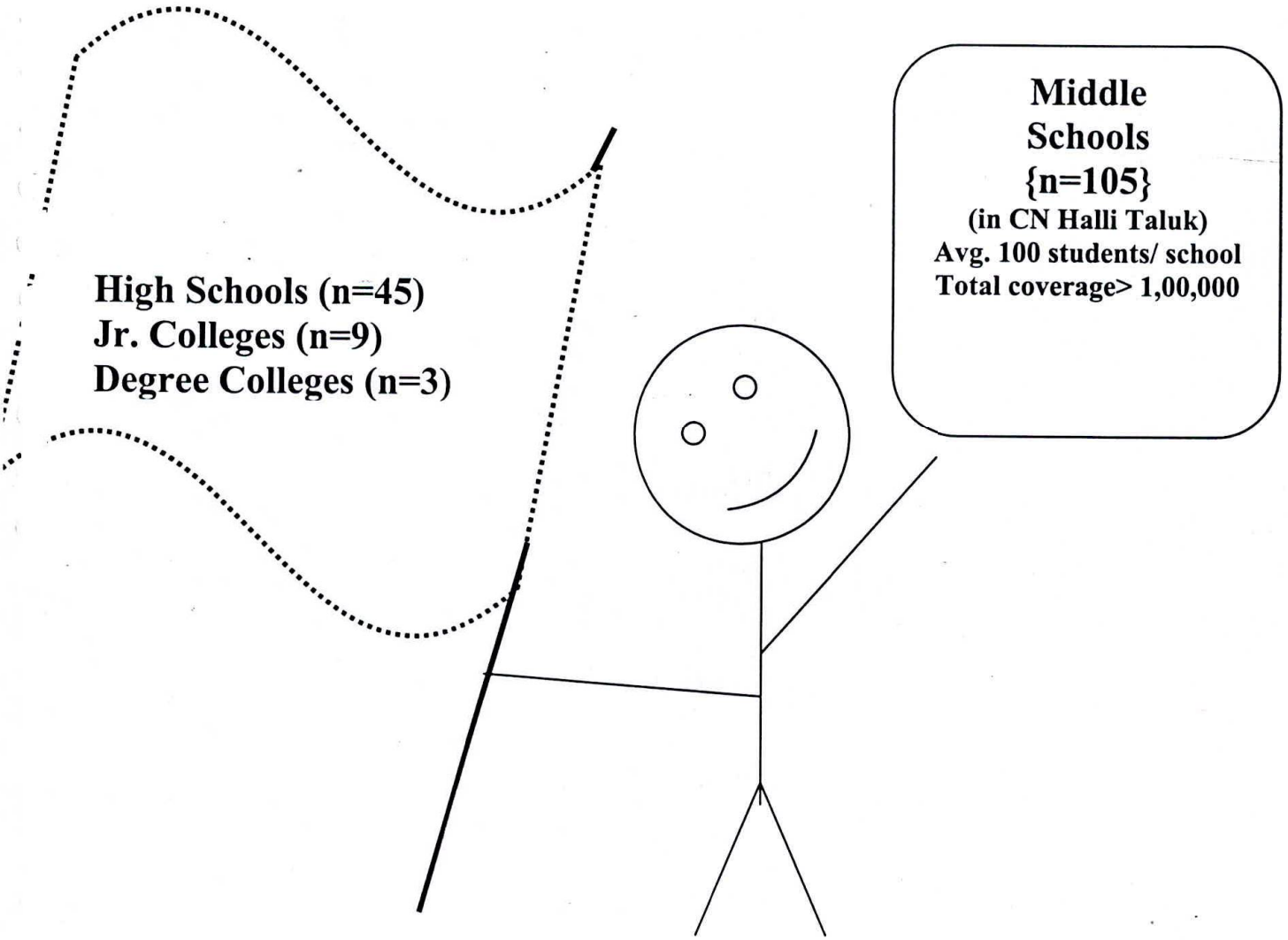


FIG. 5.4

STARTEGIES TO INVOLVE SCHOOL CHILDREN



MIDDLE SCHOOLS (n=105 teachers)

35 teachers – in each batch,

Total = 3 Batch,

Tools- STL module on malaria, Videos, Posters

Training Centres: 1. CN Halli Town
2. Huliyar
3. Hannadekere

HIGH CHOOLS AND JR. COLLEGES (n=50-60 teachers)

↓

50-60 teachers (combined)

↓

One batch

FIG. 5.5

STARTEGIES TO INVOLVE WOMEN IN CH HALLI TALUK

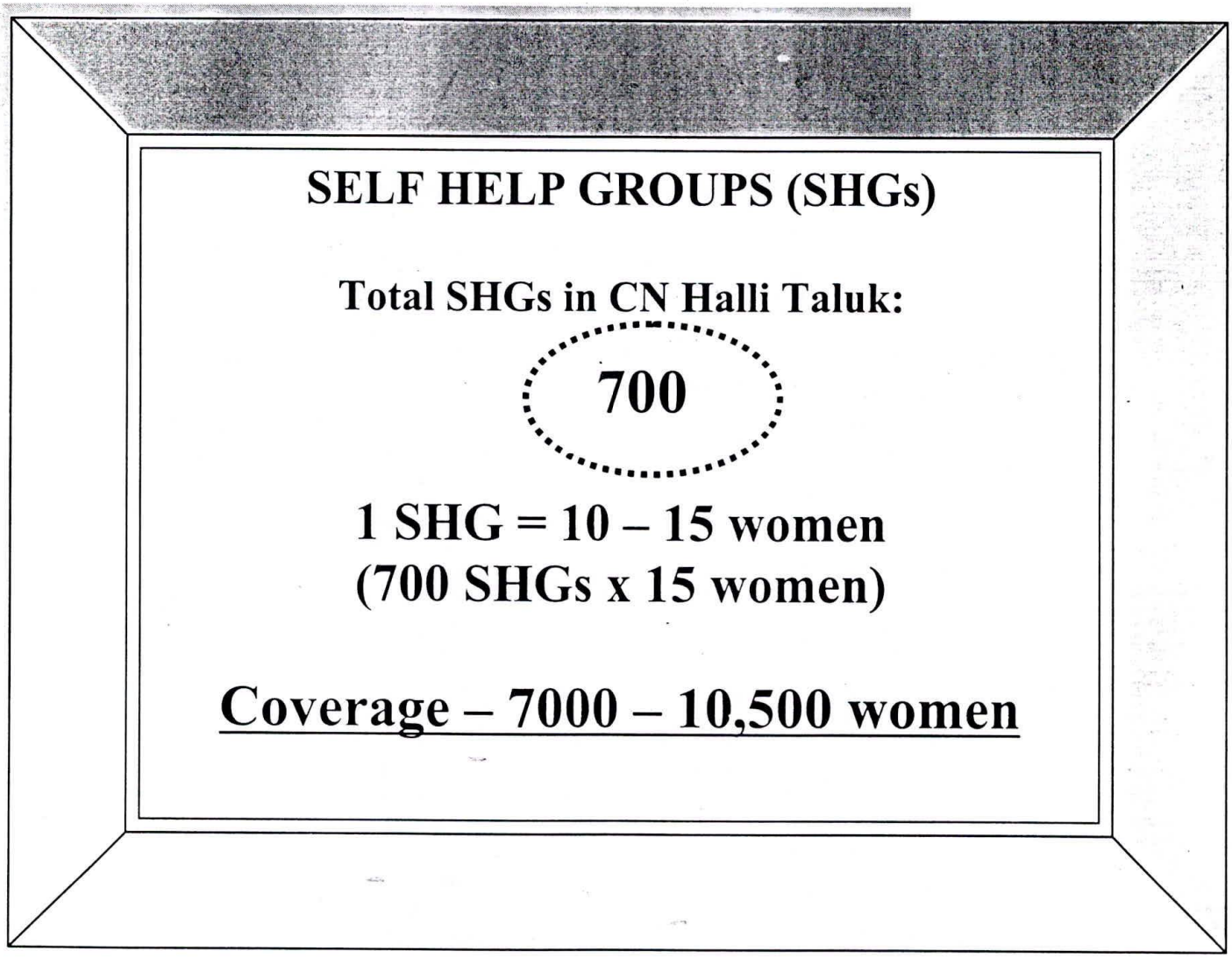


FIG. 5.6

CONTINUING EDUCATION CENTRES

Resource available :

1 Prearak & 1 up-prerak / 2000 population

CN HALLI TALUK POPULATION – 3 LACS

Hence total preraks available

100 Preraks
100 Up Preraks

Responsibilities

1. Training SHGs (4 groups at a time)
2. Smear collection
3. FTDs and DDCs
4. Facilitating conduct of Kala Jathas

FIG. 5.7

KALA-JATHA TEAMS

Composition:

Each KJ team – 10 members

(5 teacher + 5 poor artists (tailor, plumber, coolies etc))

KJ Team = 10 artists/ 1 team
Total 4 KJ teams

Total villages in CN Halli = 300

Each KJ team covers 75 VILLAGES @ 2 VILLAGES/DA @ 2 HOURS IN EACH VILLAGE

4 KJ TEAMS REQUIRE 40 DAYS TO COVER ALL VILLAGES (300) IN CN HALLI

FIG. 5.8

POTENTIAL PARTNERS FOR CONTROL PROGRAMME

I. Government Departments:

1. Leprosy, Tuberculosis, Women and Child Welfare dept.
2. Engineering Department
3. Fisheries Department
4. Irrigation Department
5. Agricultural Department
6. Department of Mines and Geology
7. Education Department

II. Other Non Government Agencies:

CHC?

1. Indian Medical Association (IMA) (Two branches at Tumkur and Tiptur)
2. Federation of Retd. Engineers Association located state HQ looking after sanitation / drainage problem
3. Voluntary Organisations - Rotary and Lions Club
4. Banks- Rural Development Cell (Canara Bank)
5. Private Medical Practitioners
   (a) Allopathy
   (b) Indian System of Medicine
   (c) Quacks / RMPS
6. Community leaders
7. Panchayat leaders
8. School teachers
9. Post Master

III National Research Institutes (Bangalore)

1. National Institute of Communicable Diseases (NICD)
   (Plague Surveillance Unit)
2. Malaria Research Centre (MRC)
   (ICMR)
3. Regional Occupational Health Centre
   (ICMR)
4. National Institute of Virology (NIV)
   (ICMR)

Conclusions

Followings are the important conclusions of the situational analysis of the district, which need specific attention.

CASE DETECTION AND TREATMENT:

A. Surveillance, and Microscopy

1. The surveillance system is generally inadequate. Many MPW posts are vacant specially that of male MPWs.
2. The quality of blood smear is generally poor, leading to poor staining and wrong identification of malaria parasites.
3. The quality of staining of blood smear is generally poor
4. It was observed that technicians are not familiar with ring stage of *P. falciparum*, and only thick smear is examined. This leads to false negativity of *P. falciparum* cases, which are with ring stages only.
5. Lack of sufficient technician: 50% of lab technician's posts are vacant. In some of the most problematic areas the laboratories are not functioning (e.g. Mathighatta PHC). This is causing undue delay in examination of the blood smears and delay in communication of result and radical treatment. It was observed that the range of delay in examination of blood smears is 7 days to 20 days and the range of RT delay following blood examination is 5 days to 15 days, in case of Mathighatta PHC.
6. The condition of microscope is generally very poor.
7. There is need of training on slide preparation and malaria microscopy. One week training on malaria microscopy and refresher course at yearly interval may be urgently organized.

B. Treatment

1. Currently in Tumkur, which has been identified as high risk areas, all fever cases are subjected to Fever Radical Treatment (FRT). The MPW give 600 mg Chloroquine and 45 mg primaquine (adult dose) on first day at the time of taking the blood smear and supposed to give 600 and 300 mg chloroquine on 2nd and 3rd respectively in his presence. But he can not do this because of work pressure. Therefore he gives the tablets to the person and asks him to take them on next two days. Our experience has shown that the patient compliance is poor in this regard. Not everybody takes the full course of tablets.

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2. The poor compliance of drug consumption is primarily due to large numbers of tablets being given on the first day FRT. At a time an adult patient is supposed to take 18 tablets of primaquine (2.5 mg) and 4 tablets of chloroquine (150 mg). It is recommended to introduce the blister pack of chloroquine (600 mg) and primaquine (45 mg) for better compliance of drug.
3. The radical treatment is supposed to be taken for five days in case of *P. vivax*. This does not happen always. In most areas with high malaria incidence, this has been reduced to three days. The total quantum of primaquine however remains same but it is distributed over three days instead of five days(30+30+15 mg for adult cases)

C. FTD/DDC

1. Currently only few FTD and DDC are working in Tumkur distict. Only the Anganwadi workers are helping out in FTD and DDC. No other community leader is helping in this regard.
2. Poor liaison is observed between MPW and FTD/DDC.

DRUG RESISTANCE

There is no data available on drug resistance in *P. falciparum*. Though the study team has generated some data on therapeutic efficacy of chloroquine against *P. falciparum*, which indicate that the parasite is susceptible to chloroquine, monitoring of drug resistance in different area is urgently required

INSECTICIDE RESISTANCE

Mechanism for periodic monitoring of insecticide resistance at subcentre levels is urgently required. There is no any record of insecticide resistance in vector, which is an essential component for policy decision on insecticides to be used in an area.

RESEARCH INPUT:

There is urgent need of research input in collaboration with research organizations to resolve some of the basic problem required for effective planning of malaria control strategy.

i. Stratification of vector species distribution especially sibling species of *An. culicifacies* and *An. fluviatilis*, which differs in distribution pattern and relative vectorial efficiency
ii. Vector incrimination studies to identify the vector species and transmission period for planning proper intervention strategies.
iii. Monitoring of insecticide resistance in two malaria vectors *An. culicifacies* and *An. fluviatilis* for the selection of proper insecticide.
iv. G.R. of breeding places for planning the release of larvivorous fishes for control of larval breeding.
v. Drug sensitivity of *P. falciparum* and *P. vivax* against commonly used antimalarials.

vi. Efficacy of 5-days radical treatment of primaquine in *P. vivax* should be studied

LOGISTIC

1. Allocation of adequate fund should be made available against TA/DA and POL to implement proper monitoring and supervision, filling up of vacancies, training etc.
2. Quality control of insecticides, insecticide spray, spraying equipments and drugs should be ensured.
3. District Malaria Officer, who is responsible for all activities related to malaria control should be empowered by providing adequate administrative and financial power.

INTERSECTORAL COORDINATION/COMMUNITY PARTICIPATION

1. The help of other government or non-government sector for malaria control is negligible. Malaria is still being perceived as a responsibility of health department. Other department does not see them role in causation of malariogenic condition or in control of such situation.
2. The fisheries department has identified existing hatcheries in Tumkur district for larvivorous fishes. But there are no mechanisms for transportations of fishes to the field.
3. The community is not aware of their responsibility. They think that malaria control is sole responsibility of government. They even don't know how they can help in malaria control. Therefore, the IEC activities should be strengthened.

While analyzing the malaria epidemiological data (1999-2000) in Karnataka state it was evident that beside few problematic talukas of Tumkur district adjoining few talukas of three other districts, namely Chitradurga, Chikmaguluru and Hussan are contributing more than 25% of total malaria cases and approximately 80% of the total *P. falciparum* cases (table-26 and fig-3) in the Karnataka state.

Weaknesses of the Programme

- **Poor surveillance- MPW post vacant.**
- **Inadequate staff in high incidence PHCs**
- **Quality of blood smear & staining poor, thin smear is not stained.**
- ***Pf* ring generally not detected.**
- **Inadequate laboratory infrastructure**
- **Cross checking mechanism poor.**
- **National drug policy not followed.**
- **FRT ineffective- poor drug compliance, 22 tablets *(Ch'quine 4 + Primaquine 18)* on day1**
- **Indiscriminate use of E-Mal/ Metakalfin/ Ablaquine**
- **RT of *P. vivax* cases is delayed.**
- **Malaria information system inadequate**
- **Lack of supervision, monitoring and analysis of data**
- **Insecticide/Drug resistance status not known**
- **Choice of insecticides and area to be covered irrational**
- **Inadequate TA/DA allocation**

Strengthening required in:

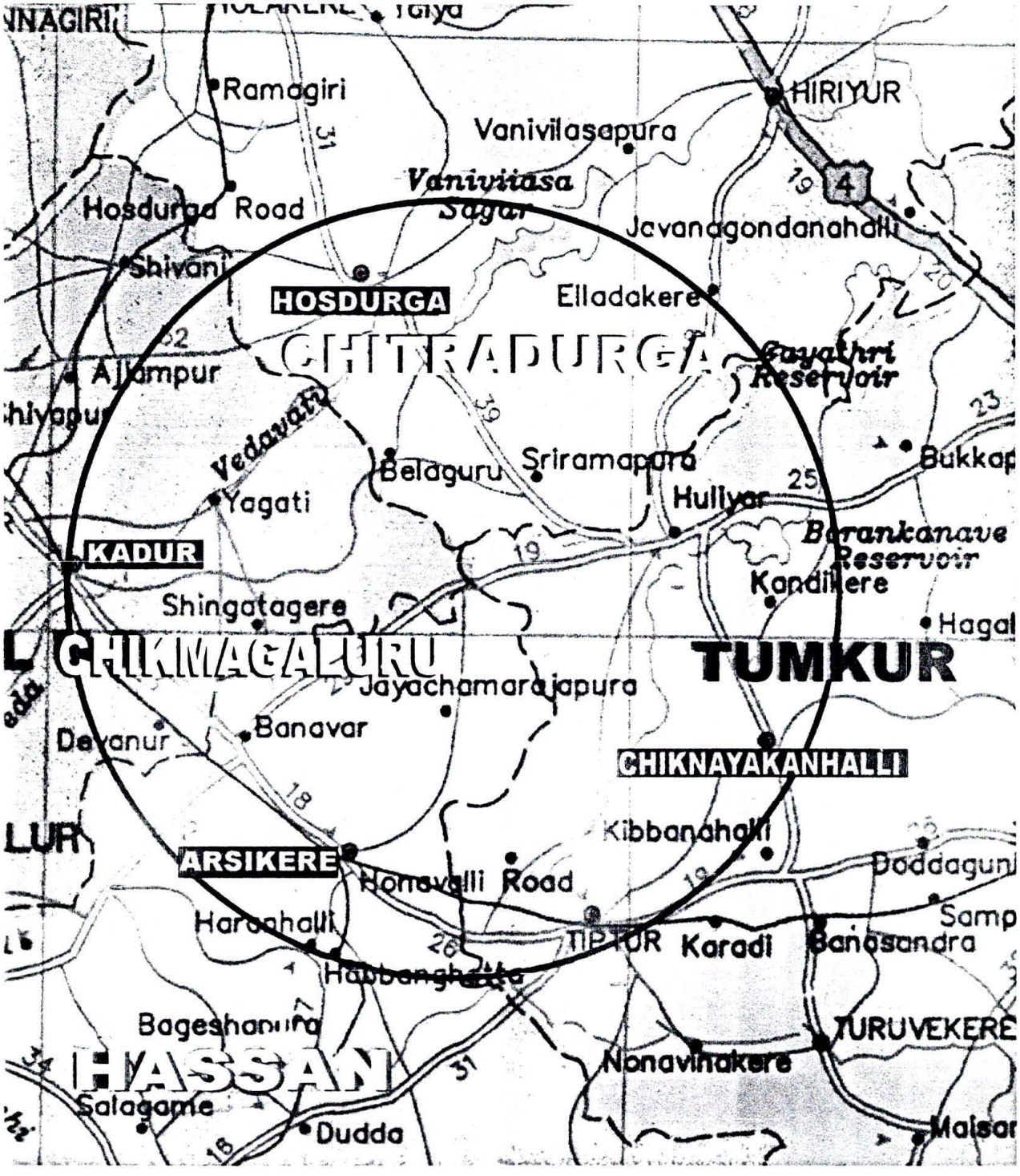
- Supervision and monitoring
- Cross checking
- Introduction of blister pack of drugs
- Monitoring of insecticide/drug resistance
- Malaria Information System
- Computerization of data, analysis and interpretation
- Training and redeployment
- Proper functioning of DDC and FTD
- GR of breeding places
- Promotion of inter-sectoral coordination
- Introduction of larvivorous fishes
- De-centralization of administrative/ financial power
- IEC involving NGOs/ Community
- Quality control of drugs/ insecticides/ spraying
- Higher budgetary allocation on TA/DA

RESEARCH INPUT

- **Vector incrimination studies**
- **Stratification of vector/sibling species**
- **Monitoring of insecticide resistance**
- **GR of breeding places for introduction of larvivorous fishes**
- **Drug sensitivity test**
- **Efficacy of 5-days RT for *P. vivax***
- **NAMP - MRC – RHO - NICD**

HIGH RISK PHC'S OF FOUR DISTRICTS

(TUMKUR, HASSAN, CHITRADURGA, CHIKMAGALUR,)



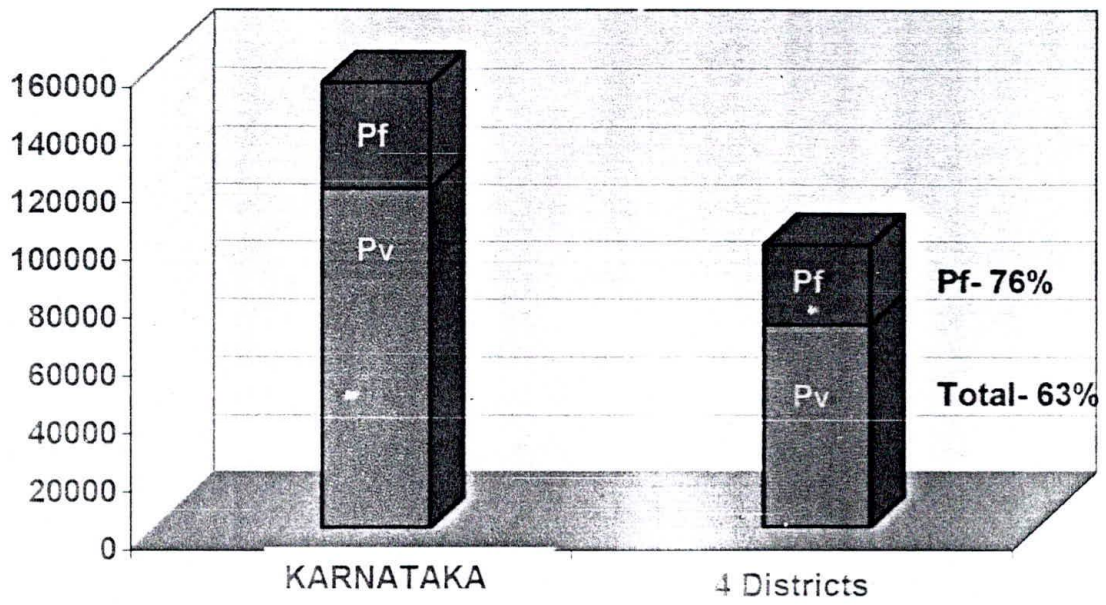
PHC"S : CHIKNAYAKANHALLI, ARSIKERE, HOSDURGA, KADUR

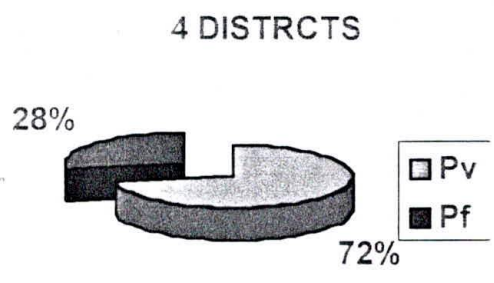
District-wise epidemiological situation of Karnataka- Jan-Sep 2001

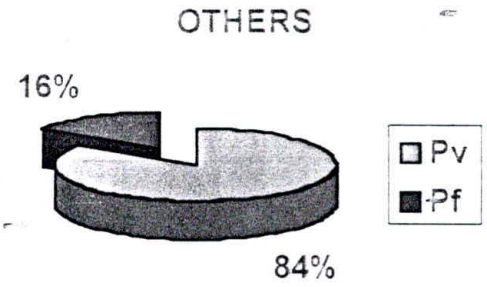
Sl.No	District	BSC	BSE	+ves	Pf	Deaths
1	Bangalore(U)	152003	149646	306	123	
2	Bangalore(R)	221479	221479	523	112	
3	Chitradurga	408854	408854	48750	13586	1
4	Tumkur	559225	552790	22371	6053	1
5	Hassan	427251	427251	7366	2506	
6	Chickmagalore	319437	315149	18998	5589	5
7	Kolar	308368	303373	3195	902	
8	Davangere	232271	228385	553	162	
9	Shimoga	206258	203686	838	174	1
10	Belgaum	443277	443277	859	184	
11	Bijapur	228192	228192	2857	234	
12	Bagalkote	239118	239118	2501	558	
13	Dharwad	191385	191385	235	38	
14	Gadag	143153	143153	339	22	
15	Haveri	246540	246540	168	10	
16	U.Kannada	164378	164378	141	9	
17	Gulburga	252337	252337	6238	753	
18	Bidar	165322	165322	800	67	
19	Bellary	171939	168307	4159	773	
20	Raichur	252595	246594	6495	1054	
21	Koppal	141054	139054	3313	394	
22	Mysore	427855	427855	3786	1219	
23	Chamrajnagar	106938	106938	114	17	
24	Mandya	844386	835089	10255	387	
25	D.Kannada	207304	207304	3120	257	
26	Udupi	230349	230349	2372	478	4
27	Kodagu	72400	72400	80	9	
28	UKP N.Pura	24633	24633	1441	675	
29	UKP Kembavi	19713	19713	521	32	
30	UKP Almatti	23338	22697	961	302	
31	UKP B.R.Gudi	7047	7047	80	6	
	Total	7438399	7392295	153735	36685	12

MALARIA INCIDENCE IN 4 DISTRICTS

(CHICKMANGALORE, HASSAN, TUMKUR & CHITRDURGA







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List of Key Health Officials of Karnataka State and Tumkur district

1. Director Health Services - Dr. G.V. Nagaraj
2. Additional Director - Dr. M.V. Murugendrappa
3. Joint Director (Malaria & Filaria) - Dr. R.K. Kumara Swamy/Dr. H.M. Basavana Gowda
4. State Scientific Officer - Mr. K.S. Sudharsan
5. State Entomologist - Mr. A. Prakash
6. In-Charge Pf monitoring unit - Dr. C. Nagaraj, Regional Office of H & F W, Bangalore
7. Bangalore Divisional In-Charge - Dr. T. Shankar.
8. Divisional Joint Director - Dr. Gangadhar Naik (Bangalore Zone)
9. Zonal Entomologist - Mr. N.S.K. Bhagawat (Bangalore Zone)
10. Sr. Regional Director - Dr. P.K. Shome, Regional Office of H & F W, Bangalore.
11. Chief Medical Officer - Dr. K. Ravi Kumar, Regional Office of H & F W, Bangalore.
12. Deputy Commissioner (Tumkur) - Mr. B.R. Jayaramaraj Urs, IAS
13. District Health Officer (Tumkur) - Dr. Chikka Basavaiah
14. District Malaria Officer (Tumkur) - Dr. S. Siddagangaiah
15. District TB Officer -Dr.Chelva Raju
16. District Leprosy Officer - Dr. J. Kishnappa
17. District Health Education Officer - Mr. S.K. Karadi
18. District Deputy Health Education Officer - Mr. R.K. Kolli
19. Administrative Medical Officer, C.N. Halli - Dr. C. Mahadevappa
20. District Women and Child Welfare officer - Dr. C. Prema Kumari (ICDS programme)
21. District Surveillance Officer - Dr. P.A. Vasanta Kumar
22. Tumkur Municipal Commissioner (Urban Malaria Scheme) - Mr. Balakrishna
23. Taluk Health Officer, C.N. Halli - Dr. P.R. Chidanandappa
24. DMO of Chitradurga District - Dr. R.S. Gopal Naik
25. DMO of Hassan District - Dr. Uma Shankar
26. DMO of Chickmagalore District - DR. N.D. Shama Rao
27. Deputy Director (NAMP), Mysore Zone -Dr. P.K. Srinivas
28. DMO of Mysore District - Dr. P.K. Srinivas
29. Community Health Cell (CHC), Bangalore - Dr. Ravi Narayan
30. Voluntary Health Association of Karnataka - Ms. T. Neerajakshi