

MORBIDITY AND MORTALITY DUE TO MALARIA IN TARAJULIE TEA ESTATE, ASSAM, INDIA

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Abstract. Beginning 1991, a sudden rise of malaria cases were recorded in Tarajulie TE (Assam) coupled with mortality due to malaria. Deaths were confirmed due to *Plasmodium falciparum* (Pf) infections and were recorded in all age groups excluding infants. Malaria positives were recorded in all months of the year, however, there was a increased hospital attendance due to fever/malaria positives during May to September. During the years (1991-1993), the slide positive rate was as high as 33.04%, mostly being Pf infections (69%), and the annual parasite index ranged between 6 to 304 per thousand population. Morbidity and mortality due to malaria were attributed to labor movements to and fro from garden premises to adjoining hamlets, the latter being the site of acquisition of the infections.

INTRODUCTION

Tea is the major produce of Assam, and there are over 800 tea estates comprising nearly 7% of total population of the State. In the pre-control era many of the tea estates had suffered heavy losses due to malaria epidemics depleting man power and tea production (Macdonald and Chowdhury, 1931; Gilroy, 1958). With the application of residual insecticides, ie DDT, BHC after second world war, there was a continuous and steady decline in morbidity due to malaria until its resurgence in 1970's (Viswanathan, 1941; Sharma and Mehrotra, 1986). At present, malaria has become the major health problem in some of the tea estates particularly those located along the forest fringe areas of Bhutan and Arunachal Pradesh. Included in this report is data on morbidity and mortality due to malaria during the years 1990 to 1993 based on the hospital records of Tarajulie Tea Estate, (District Sonitpur, Assam) in the garden population.

MATERIALS AND METHODS

Tarajulie TE is located on the North bank of the Brahmaputra river (26° to 27°; 92° to 93°) and has plantation over 492 hectares with adjoining government reserve forest area along the Arunachal border. There are several perennial streams which

pass through the adjoining hamlets and garden premises which are the breeding source of the vector species, *Anopheles minimus* (Dev, 1994). The garden laborers (mainly tribes of various ethnic origin) live in quarters provided by the management but there is a uninterrupted movement of laborers to and fro between garden labor lines and adjoining hamlets. The temperatures and relative humidity are conducive throughout the year for mosquito proliferation and survival. The meteorological data for the year 1991 are given in Table 1. For control of malaria, besides chemotherapy, anti-malarial measures such as 2 to 3 rounds of DDT spray, fogging and antilarval measures were routinely done every year by the garden management with help of district health authorities but were restricted to garden premises only.

To determine malaria incidence, blood smears were taken from the fever patients in the outdoor clinic of the garden hospital for parasitological examination. Blood smears (both thick and thin) were stained with JSB (Jaswant Singh Bhattacharyjee) stain, and were examined for malaria parasite. All malaria positive cases were administered antimalarial drugs as per National drug policy.

RESULTS AND DISCUSSION

Although malaria had resurged in several States of India including Assam, yet cases recorded were only few and far in Tarajulie Tea estate until 1991. In the year 1990, only 22 malaria positives were

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Table 1
 Meteorological data of Tarajulie TE, Assam,
 India.

Month (1991)	Mean temperature		Rainfall total (mms)
	Maximum (°C)	Minimum (°C)	
January	22.5	9.0	17.4
February	25.5	13.5	34.6
March	29.0	17.5	52.8
April	28.0	19.5	113.6
May	27.0	22.0	473.2
June	30.0	25.5	574.2
July	32.5	26.5	329.4
August	31.5	26.0	383.4
September	30.5	25.0	479.2
October	29.5	22.0	244.2
November	27.0	14.0	13.2
December	22.5	9.5	23.0

recorded in the outpatient clinic of the garden hospital (Table 2). However, besides regular antimalarial measures, there was a sudden rise of malaria cases beginning March 1991 coupled with deaths due to Pf (Table 3). There was increased hospital attendance due to fever coupled with malaria positivity. In the year 1991, of the total 2,235 blood slides examined, 23.67% were malaria positive. As many as 14 deaths were recorded in this year alone and were confirmed due to Pf on parasitological examination. In the following year, (1992), incidence of malaria remained on the rise with notable upsurge in Pf cases (69%), but only one death was confirmed due to Pf. In 1993, a similar trend continued; SPR was 27%, and 67% were Pf infections. In addition, 5 deaths were attributed due to

Pf. In the hospital clinic, although malaria positive were recorded during all months of the year, there was preponderance of fever cases/Pf positives during May to September corresponding to the peak malaria transmission period in Assam.

Of the total 20 deaths due to Pf during the years 1991-1993, four each were in the 1-5 and 5-15 years age groups, and 12 occurred above 15 years of age (Table 4). A good proportion of these deaths occurred during May to August, more so in males than females. On close scrutiny, causes of death appeared to be late reporting resulting in late diagnosis and treatment. Much was attributed to movement of garden laborers to and fro between garden premises (with intervention measures) and adjoining hamlets (without intervention), the latter being the site of acquisition of malaria infection transmitted by the vector, *An. minimus* (Dev, 1996).

Although initially there appeared to be low response to chloroquine, yet *in vivo* follow up studies revealed that parasites were sensitive (Gogoi *et al*, 1995). Thus, early case detection and treatment coupled with personal protection methods appeared to be the ready solution to reduce morbidity and mortality due to malaria. For the control of malaria, insecticide impregnated bednets were recommended as a personal protection method to reduce man/vector contact, thereby disrupting malaria transmission in such terrains (Dev *et al*, 1994).

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Table 2
 Morbidity due to malaria in Tarajulie TE, Assam, India^a.

Year	OPD	BSC/E	Malaria positive	SPR	%Pf	API/1,000
1990	NC ^b	654	22	3.36	54	06
1991	13,950	2,235	529	23.67	49	140
1992	15,026	3,477	1,149	33.04	69	304
1993	14,469	3,282	894	27.24	67	236

^a Population: 3,781.
^b NC = data not collected

Table 3

Malaria incidence and mortality due to Pf malaria in Tarajulie TE, Assam, India^a.

Year Month	1990			1991			1992			1993		
	BSC/E +ve	Pf	No. of deaths	BSC/E +ve	Pf	No. of deaths	BSC/E +ve	Pf	No. of deaths	BSC/E +ve	Pf	No. of death
January	11	0	0	46	0	0	32	8	0	64	17	1
February	16	0	0	31	1	1	28	9	0	59	16	3
March	23	1	0	97	7	0	45	11	0	121	14	4
April	32	0	0	246	29	9	117	15	6	168	31	15
May	65	3	3	513	122	41	768	270	220	393	113	72
June	90	3	2	717	246	142	487	188	138	785	207	176
July	188	6	4	132	35	28	802	256	220	616	173	136
August	65	1	0	206	46	22	498	167	113	400	130	91
September	61	2	1	102	18	10	286	79	44	249	66	38
October	38	3	0	92	12	4	164	62	25	194	51	24
November	38	1	0	29	8	3	139	47	15	151	47	23
December	27	2	2	24	5	0	111	37	11	82	32	17
Total	654	22	12	2,235	529	260	3,477	1,149	792	3,282	894	600

^a Source: Passive case detection at Tarajulie TE hospital

Table 4

Age/sex wise distribution of deaths due to Pf malaria in Tarajulie TE, Assam, India.

Age group (years)	No. of deaths						Total
	1991		1992		1993		
	Males	Females	Males	Females	Males	Females	
0 - 1	0	0	0	0	0	0	0
1 - 5	1	1	0	0	1	1	4
5 - 15	2	0	0	0	2	0	4
> 15	5	5	1	0	1	0	12
Total	8	6	1	0	4	1	20

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