MALARIA IN MALAYSIAN SOLDIERS, 1980

V. SUPRAMANIAM

SUMMARY

The 1980 malaria notifications in Malaysian soldiers are analysed. The number of new cases notified was 964, giving an annual incidence of 11.81/1000 soldiers. Sixty-three percent were falciparum and 36 percent were vivax infections. There were 48 relapses and recrudescences. Twenty-three carriers were detected on mass screening. The yield from mass screening was very low — 5.09/1000 screened. The current practice of chemotherapy, though generally acceptable, was unsuitable for a number of patients. Recommended regimens are not being adhered to. There were two cases of cerebral malaria, one of whom died.

INTRODUCTION

Malaria continues to be a significant problem in this region including Malaysia (New Sunday Times, 1979). To the Malaysian soldier in the field, it is his major problem. Chemoprophylaxis is his primary weapon against the malaria parasite. The war is a never ending one with no sign of victory. This paper describes the malaria status among Malaysian soldiers during the year 1980.

MATERIALS AND METHODS

The primary source of data is the notification of malaria cases to the Medical Directorate, Ministry of Defence, which is used to monitor the malaria situation. In addition, death certificates were checked for malaria and information obtained from army medical officers who had conducted mass screening campaigns during the year.

RESULTS

One thousand and forty notifications on malaria were received in 1980 from units based throughout Malaysia. Four were cases of clinical malaria, and one was in an air force personnel all of which were excluded from the series. Of the 1035, 48 were relapses and recrudescences, 23 were parasite carriers picked up on mass screening, and 964 were primary attacks considered as new infections. The annual incidence of primary attacks is 11.81/1000 soldiers. Only new cases were analysed. All cases included in this study were diagnosed as malaria on the basis of a positive peripheral smear with symptoms and/or signs and recorded as such in the notification.

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Age Distribution of the Cases by Plasmodium Species

Table I shows the age distribution of the cases by parasite species. Eight-three percent of the cases were in the age group 20-29 and reflect the age structure of the army population which was a relatively young one. *Plasmodium falciparum* predominated with 63 percent followed by *Plasmodium vivax* 36 percent with a nearly 2 : 1 ratio. Since 1970, the ratio of *P. falciparum* infections to *P. vivax* infections has been 2 : 1 or greater (Yudishthira, 1979). Only one case of Plasmodium malariae was diagnosed. Seven were mixed infections of *P.vivax* and *P.falciparum*.

Distribution of Cases by Occupation

Ninety-nine percent of the cases were infantry men. These were the ones at greatest risk of infection as they were the foot soldiers whose duty took them into malaria endemic areas. The incidence in soldiers of other categories was low which was due to their decreased exposure.

TABLE I
AGE DISTRIBUTION OF MALARIA CASES AMONG SOLDIERS BY PARASITE SPECIES, 1980

Age	P.v	P.f	P.m	Mixed (P.v. & P.f.)	Not Stated	Total
< 20	10	18				28
20-24	191	323	1	6	1	522
25-29	103	170		1		274
30-34	27	69				96
35-39	7	26				33
≥ 40	4	7				11
Total	342	613	1	7	1	964
%	35.48	63.59	0.10	0.73	0.10	100

*P.v. = P.vivex P.f. = P.falciparum P.m. = P.malariae

TABLE II
DISTRIBUTION OF CASES BY PLACE OF INFECTION AND PARASITE SPECIES, ARMY, 1980

	P.v.	P.f.	P.m.	Mixed (P.v. & P.f.)	Not Stated	Total (Percent)
(1) Perlis	2	2				4 (0.41)
(2) Kedah	30	31				61 (6.33)
(3) Perak	184	264		6	0	454 (47.10)
(4) Penang	0	1				1 (0.10)
(5) Selangor	1	1				2 (0.21)
(6) Negeri Sembilan	2	2				4 (0.41)
(7) Malacca	2	4				6 (0.62)
(8) Johore	9	10		1		20 (2.07)
(9) Pahang	20	100	1		1	122 (12.66)
(10) Trengganu	4	3			0	7 (0.73)
(11) Kelantan	25	162			0	187 (19.40)
(12) Sabah	19	13				32 (3.32)
(13) Sarawak	7	0				7(0.73)
(14) South Thailand	3	1				4 (0.41)
(15) Unknown	34	19				53 (5.50)
Total	342	613	1	7	1	964 (100%)

Distribution of Cases by Place of Infection and Plasmodium Species

Table II shows the place of infection by type of parasite. Ninety percent of the total infections were in Peninsular Malaysia. Forty-seven percent were acquired in Perak State, followed by 19 percent in Kelantan and 13 percent in Pahang. Less than 10 percent of the cases were from the remaining states. Falciparum infections predominated over vivax in a ratio of 1.4: 1 in Perak, 6.5: 1 in Kelantan and 5: 1 in Pahang. The places in Perak which contributed to the majority of the cases were Grik, Kroh, Sg Siput, Lasah, Ulu Kinta, Ulu Chemor. In Kelantan, the areas were Batu Melintang, Tanah Merah, Gua Musang, Machang and Pasir Puteh. Cameron Highlands and Raub were two important locations in Pahang. There was no transmission of malaria within Armed Forces camps and bases. All the cases were imported and none were indigenous.

Distribution of Cases by Month

Fig. 1 shows the cases distributed by month. The first seven months showed a consistently high incidence compared to the rest of the year. These variations were highly dependent on the intensity of the operations or exercises when large numbers of soldiers were deployed.

Parasite Carriers

Mass screening of soldiers after field duties was carried out periodically and 23 were notified as carriers. Of these, 9 were vivax and 14 falciparum infections. Five carriers acquired their infection in Pahang; Kedah and Kelantan produced one each and the rest were from Perak. Information on prophylaxis recorded for 17

TABLE III

MASS SCREENING FOR CARRIERS AMONG MALAYSIAN SOLDIERS, 1980

Date	Type of Personnel	No of Soldiers Screened	Carriers Detected	Parasite Rate/1000	Remarks
Feb 80	Infantry	189	4	21.16	After Ops duties in Cameron Highlands.
July 80	Infantry, Engineers, Artillery, Ordance.	1967	0	0	After Ex Gonzales IV. 326 screened in Taiping and 1641 in Ipoh.
Sept 80	Infantry, Transport.	521	11	21.11	470 infantry soldiers in Ipoh. 51 transport personnel in Taiping — all negative.
Dec 80	Infantry	270	0	0	After Ex Gonzales V in Mersing area.
	Total	2947	15	5.09	

carriers showed 14 to be on 1 tablet Daraclor (brand name for chloroquine-pyrimethamine — one tablet contains 150 mg chloroquine base and 15 mg pyrimethamine) on alternate days, 1 on 1 tablet weekly, 1 on 2 tablets weekly, and one was not on any prophylaxis. The *P.vivax* and *P.falciparum* carriers were treated similarly to primary cases with oral chloroquine and primaquine or chloroquine, primaquine and Fansidar (trade name for pyrimethamine-sulphadoxine. One tablet contains 25 mg pyrimethamine and 500 mg sulphadoxine). Table III shows the data of the mass screening done in Ipoh and Taiping. The parasite detection rate was only 5.09/1000 soldiers screened. In two mass screenings, involving 2237 soldiers, no carriers were detected. Of the 15 detected, only 7 were notified.

Relapses and Recrudescences

Fifty-five cases were notified as relapses or recrudescences. In two of these the parasite species in the initial and subsequent attacks were different. Adopting the criteria of recrudescence as occurring within 60 days from the completion of treatment of the initial attack for falciparum cases, as the Sabah malaria programme has generally accepted, (Sabah Malaria Control Programme, 1981) 5 cases were positive beyond this period and hence considered as new cases. For vivax cases, the period adopted was 1 year. Notifications of the first attack was traced for 34 cases.

Of the 48 cases, only two were relapses (vivax) and the rest were recrudescences of falciparum malaria. Two soldiers had recrudescence thrice and two others twice. Three were picked up on monthly follow-up. The time interval between the first attack and the first recrudescence ranged from 10 days to 59 days with a median of 29 days. For the two relapse cases, the interval was 17 and 59 days.

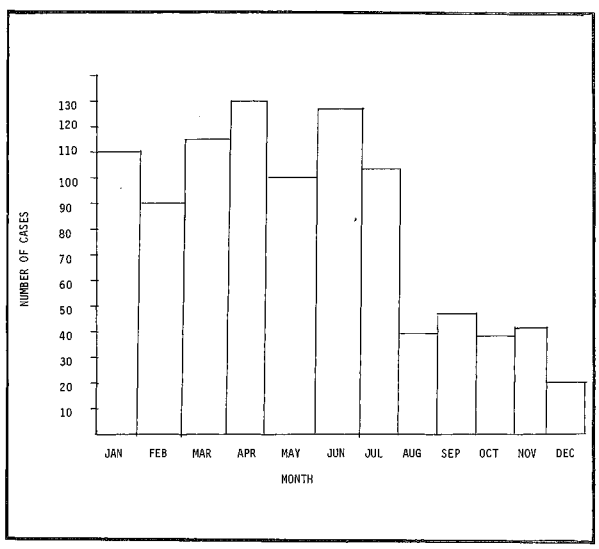

Fig. 1 Distribution of malaria cases by month among Malaysian soldiers, 1980.

Treatment of the recrudescences, where recorded, was the same as the primary attack in 4 cases; 10 cases had Fansidar (3 tablets) added to the chloroquine and primaquine regimen. In 3 patients the chloroquine was increased from 1500 mg to 1800 mg base with the primaquine dosage unchanged. In all, 15 cases were treated with Fansidar, chloroquine, and/or primaquine.

Chemoprophylaxis of Primary Cases

Information on chemoprophylaxis was recorded for 335 cases only. Forty were on Fansidar, 11 admitted to not taking drugs, and the rest were on Daraclor. In 14 persons the dosage of Daraclor was not stated. Over 92 percent were on one tablet of Daraclor every other day (recommended dosage). Five were on 1 tablet weekly, 14 on 2 tablets weekly and one on 2 tablets every other day. Those on Daraclor recommended dosages acquired their infections in Grik (87 cases), Banding (45), Ulu Kinta (36), Kroh (45), Cameron Highlands (26), Raub (18), Bentong (18) and other places. In all, 97 cases were vivax infections and 151 falciparum.

Forty were on Fansidar — 34 on 3 tablets monthly, 5 on 2 tablets fortnightly and for one dosage was not stated. There were 23 vivax, 16 falciparum and one mixed infection for this group. The excess of vivax cases over falciparum indicates that Fansidar is less active in reducing the incidence of vivax infections. Indications to this effect had been shown in a recent study (Pearlman *et al*, 1980.)

Chemotherapy of Primary Cases

Seven hundred and sixty two notifications had information on chemotherapy recorded and 80 different regimens (differences in drugs, dosages and/or duration of treatment) were given. Some schedules were used for only one case. Table IV shows the common ones. The primary drugs used alone or in combination were chloroquine, primaquine and Fansidar. Quinine was used for a few cases. In 128 cases chloroquine and primaquine courses were given without dosages and duration of treatment. Chloroquine was generally used for the first 3 to 5 days of treatment in vivax and falciparum infections. Primaquine was, however, used for 3/5/7/14 days to treat both vivax and falciparum infections. Six cases of vivax infections were treated with a course of oral chloroquine only. Fansidar was used to treat a total of 195 cases, all of which were falciparum infections except 19 vivax cases. It was used as an initial dose only as 2, 3 or 4 tablets with chloroquine or with primaquine or with chloroquine and primaquine. Unusual and rare combination and dosages of drugs used were seen. One case of falciparum was treated with Fansidar 4 tablets, chloroquine base 2400 mg over 3 days and primaquine 15 mgm twice daily for 14 days.

Mortality

Two cases of cerebral malaria were reported in infantry soldiers. One recovered with active treatment, while the other died. These cases occurred soon after operational duties. Details of chemoprophylaxis were not available.

DISCUSSION

The sheet anchor of malaria prevention in the field in the Malaysian Armed Forces is chemoprophylaxis. Paludrine (100 mg daily) was first used until 1962 when *P. falciparum* showed resistance to paludrine (Montgomery *et al*, 1963). Daraclor was substituted in a dosage of one tablet weekly. In 1970, this was increased to two tablets and then in 1972 to 2 tablets weekly when strains of *Plasmodium falciparum* resistant at the RI level were present in many parts of Malaysia as determined by the WHO Standard Field Test, by isolation of sentinel strains, and by in vitro tests (WHO, 1973).

In 1977, Fansidar was given to soldiers operating near the Malaysia-Thai border (Datta, 1979) due to the presence of chloroquine resistant strains in this area. The drug was shown to be effective against local strains of *P. falciparum* (Lewis and Ponnampalam, 1975). In early 1980, Fansidar was introduced as the drug of choice for chemoprophylaxis throughout Malaysia, while Daraclor was to be phased out. Notwithstanding this, nearly one thousand new cases of malaria were notified. What went wrong? Human and parasite "resistance" were involved. For the chemoprophylactic to be effective it should be consumed regularly at the recommended dosage one week before, during, and four weeks after field duties. In this study, information is incomplete. Eleven soldiers did not receive prophylaxis. Nineteen were on inadequate prophylaxis — one or two tablets of Daraclor instead of 3 weekly. Prophylactic drugs are to be given under supervision (Armed Forces Council Instruction, 1966) but this was not always done and in certain situations this was not possible especially during the four weeks after jungle operations when they were normally given time-off. Drug compliance was shown to be lacking in previous outbreaks (Datta, 1971) and cannot be ruled out here. Clinical confirmation of resistance was obtained when even after a full course of radical treatment of 227 falciparum cases from one area, 52 percent had recrudescenes. (Datta, 1979). These soldiers were on Daraclor one tablet on alternate days. These resistant strains were from Thailand and the current cases do not

TABLE IV
TREATMENT REGIMENS OF MALARIA CASES AMONG SOLDIERS BY PARASITE SPECIES, 1980

		P.vivax	P.falciparum
1.	Chloroquine course	6	31
2.	Tab Chloroquine base 1800 mg over 4 days	0	27
3.	Chloroquine + Primaquine course (no details given)	73	53
4.	Chloroquine course + Tab Primaquine 15 mg daily for 14 days	12	13
	Tab Chloroquine base + Tab Primaquine		
5.	900 mg over 3 days + 15 mg daily for 14 days	3	2
6.	1350 mg over 3 days + 15 mg daily for 5 days	1	44
7.	1350 mg over 3 days + 15 mg daily for 14 days	106	5
8.	1500 mg over 3 days + 15 mg daily for 5 days	0	10
9.	1500 mg over 3 days + 15 mg daily for 14 days	30	5
10.	1800 mg over 4 days + 15 mg daily for 5 days	1	9
11.	1800 mg over 3 days + 15 mg daily for 7 days	4	8
12.	1800 mg over 4 days + 15 mg daily for 14 days	36	31
13.	2250 mg over 5 days + 15 mg daily for 14 days	0	9
	Tab Fansidar + Tab Chloroquine base + Tab Primaquine		
14.	Fansidar + Chloroquine course + Primaquine course	8	8
15.	2 stat + 1350 over 3 days + 15 mg daily for 3 days	0	17
16.	2 stat + 1350 mg over 3 days + 15 mg daily for 5 days	0	9
17.	2 stat + 1800 mg over 3 days + 15 mg daily for 3 days	0	6
18.	3 stat + 1350 mg over 3 days + 15 mg daily for 5 days	1	82
19.	3 stat + 1800 mg over 3 days + 15 mg daily for 14 days	2	4
20.	3 stat + 2700 mg over 5 days + 15 mg daily for 5 days	0	8
21.	Tab Fansidar 3 stat + Tab Primaquine 45 mg stat	0	8
22.	Quinine sulphate + Septrin* + Fansidar	5	0
	Total	287	389

Note: Treatment given for less than 5 individuals are not shown.
*Septrin is the brand name for trimethoprim-sulphamethoxazole.

come from these operational areas. Fansidar resistance has also been reported in Thailand (Centre for Disease Control, 1980), Papua New Guinea (Darlow *et al*, 1980) and in most other countries of this region.

Prophylaxis and treatment for malaria is standardised and set out in an Armed Forces Medical Instruction (AFMI, 1980). The recommended treatment schedule is the same as that of the National Malaria Programme (NMP). Vivax malaria is to be treated with 1500 mg of chloroquine base over 3 days and oral primaquine 15 mg daily for 14 days (adult dosage). Radical treatment for falciparum and malariae infections in adults is Fansidar 2 tablets stat, oral chloroquine base 1350 mg over 3 days, and oral primaquine 15 mg daily for 3 days (NMP, 1980). However, a wide range of different treatment schedules were used. One hundred and twelve vivax cases were treated with primaquine and with less than the minimum of 1500 mg chloroquine base though this dosage can be decreased 20-25 percent for a very light individual as 1500 mg is for a 70 kg patient (Bruce Chwatt, 1980). It is very much doubted that the decreased dosage is for that reason. Six vivax infections were not given radical treatment with primaquine to eradicate the secondary tissue phase. Seven cases with vivax infections were treated with 15 mg primaquine daily for 5 to 7 days, less than the recommended 14 days (WHO, 1973). Fifty eight falciparum infections though given radical treatment, were not treated with primaquine to eradicate the gametocytes to prevent them acting as reservoirs of infection. A total of 78 falciparum infections were treated with oral primaquine 15 mg daily for 14 days, which was unnecessary based on current recommendations. It has recently been reported in Thailand that even with oral primaquine 15 mg daily for 5 days for *P. falciparum* cases, 25 percent of patients are potential gametocyte carriers for 21 days (Bunnag *et al*, 1980). This calls for similar monitoring of *P. falciparum* cases after treatment with current schedules, though their potential for infectivity is unknown.

Mass screening benefits the individual by detecting and treating his carrier status, and the community by preventing the introduction of carriers to new areas where suitable vectors and climatic conditions prevail as in most parts of Malaysia. However, the yield has been very low — 5.09/1000 soldiers screened. Selective screening of soldiers from high risk areas may be more useful than indiscriminate mass screening.

Cases of falciparum malaria are followed up at monthly intervals for 6 months and for 1 year in the case of vivax infections. This yeilded three asymptomatic recrudescences. The extent of follow-up for cases is presumed to

be low as no special records are maintained in all the medical establishments for recall of patients. The individual has to come of his own accord and this is doubtful especially if he is well. The usefulness of this length of follow-up has to be firmly established.

Generally, recrudescences are presumed to be due to drug resistance (true or relative) and hence treatment of recrudescences are with additional drugs (true parasite resistance) or increased doses of the same drugs (relative parasite resistance). Here four recrudescences were treated with same drugs in the same dosage. They were all cured. Four soldiers with repeated recrudescences were possibly cases with multiple drug-resistance. They were eventually cured with chloroquine, primaquine and Fansidar. Treatment of primary attacks of *P.vivax* and relapses are the same (Woodruff, 1974). No details of treatment were available for 2 of the cases notified.

Notifications, as with many diseases, are incomplete. Notifications of primary attacks for 27 relapse cases were not made, and for 8 of the 15 carriers detected. Underreporting of primary cases is also likely as has been found previously (Armed Forces Annual Health Report, 1973). Even with these discrepancies, it is generally believed that notifications reflect a fairly accurate picture of malaria in the Malaysian army. Though the presence of chloroquine resistant strains of *P. falciparum* has been established in Malaysia, studies should be carried out to map out the areas with more precision to aid in prophylaxis and treatment. Currently this is a guessing game. *Plasmodium falciparum* resistant to Fansidar has been reported and the situation must be closely monitored by clinical, parasitological and epidemiologic studies. Chemotherapeutic measures need improvement and a one or two day refresher course on malaria, tuberculosis and sexually transmitted diseases given to doctors commencing their housemanship is likely to improve patient care and benefit the control progammes.

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