

# MALARIA IN THE MALAYSIAN ARMY WITH PARTICULAR REFERENCE TO CHEMOSUPPRESSIVE USE

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## SUMMARY

*Malaria is the most important communicable disease in the field for the Malaysian soldier. His chief weapon is chemoprophylaxis. This was proguanil hydrochloride in the '50s, changed to Daraclor in 1962; since late 1985, Fansidar only is used. The incidence of malaria over the years has fluctuated widely and had its peak in 1977 at 29.7/1,000 soldiers and since then has shown a downward trend. Studies carried out to study the problem are noted briefly. Antimalarial discipline in the field, continued surveillance and integrated control measures in the base are emphasised in the fight against malaria.*

## INTRODUCTION

Malaria is an important public health problem of our country and for the Malaysian soldier, malaria is the major disease he is exposed to during jungle operations. Though the incidence has been considerably reduced, it still poses a threat to our soldiers. Continued surveillance is absolutely necessary to maintain it under control. This paper describes malaria in the army with particular reference to chemosuppressive use.

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Malaysia is engaged in a guerilla war against the communists lurking in the jungles. The security forces, mainly the foot soldiers in the armed forces and police field force personnel, are involved in this war.<sup>1</sup> They operate in the deep jungles, remote villages and other areas where malaria transmission continues and the National Vector Borne Disease Control Programme (VBDCP) is unable to operate due to the areas being inaccessible and/or to the security situation.<sup>2</sup> These are the areas where our soldiers contract their infection from among *orang asli* (tribal peoples) and the villagers, who harbour the parasites.

## METHODS AND MATERIALS

Malaria is a notifiable disease under the Quarantine and Prevention of Disease (Amendment) Act 1971; notifications are made to the relevant health authorities by army medical officers. The Medical Directorate within the Ministry of Defence receives a copy of all notifications and this has been the primary source of data for malaria incidence. Death certificates of all soldiers who died during this period have been scrutinised for deaths certified as due to malaria. The annual reports of the Ministry of Health VBDCP have also been utilised for this study.

The army incidence is calculated using the total army population as the denominator. This is not accurate as the whole population is not at risk of contracting malaria. Only soldiers operating in malaria endemic areas and others on leave in malaria endemic villages are liable to be infected by malaria parasites, and their numbers vary from

time to time and are not readily available. Hence, the total army population has been used for all the years.

## RESULTS

### Incidence

Table I shows the malaria incidence of various population groups in Peninsular Malaysia.<sup>3</sup> The Armed Forces' contribution has gradually dropped from a high of 13.1% in 1980 to 2.4% in 1985, which is very encouraging.

Fig. 1 shows the annual incidence of malaria infection (here defined as cases with symptoms and a positive peripheral smear) for the years 1967 to 1985. Paludrine hydrochloride (100mg daily), used by the British Army, was the chemoprophylactic used in the early 1950s and the incidence remained low. In 1962, Daraclor (combination of chloroquine sulphate equivalent to 150mg chloroquine base and 15mg pyrimethamine) one tablet weekly was introduced after a field trial established it as equally effective. Paludrine was then phased out.

The incidence of malaria started to climb in 1967 and in 1970 was above 10/1,000 for the first time. This was the result of our soldiers operating from 1969 in highly endemic *Plasmodium falciparum* chloroquine-resistant areas along the Malaysia-Thai border. A study carried out on urine chloroquine showed inadequate levels continuously for a week and therefore the weekly dosage of one tablet was increased to two per week (three days apart) from mid-1970.<sup>4</sup>

In 1971, seven soldiers with *P. falciparum* treated with a standard dose of chloroquine indicated R1 type of resistance.<sup>5</sup> The dosage of Daraclor was hence increased from two to three tablets per week (one on alternate days) from mid-1971 and the incidence began to fall and continued the following two years.

In 1974, the incidence started to climb once again and in 1976 it was 29.7/1,000, the highest recorded to date. Two studies — four tabs of Daraclor statum weekly<sup>6</sup> and three tabs of Daraclor statum weekly against one tab of Daraclor on alternate days (unpublished) — were done in 1976 but no changes were effected as the results were not significant.

TABLE I  
MALARIA CASES BY POPULATION GROUPS IN PENINSULAR MALAYSIA (1976 – 1985)

Year	Population Groups				Village residents and others (%)	Total (%)
	Armed Forces (%)	Police Field Force (%)	Aborigines (%)	People in land Schemes (%)		
1976	1148 ( 7.7)	525 (3.5)	842 ( 5.6)	1375 ( 9.2)	11041 (74.0)	14931 (100)
1977	1452 (10.6)	423 (3.1)	751 ( 5.5)	1743 (12.8)	9280 (68.0)	13649 (100)
1978	715 ( 6.9)	321 (3.1)	1024 ( 9.9)	1621 (15.6)	66844 (64.5)	10365 (100)
1979	867 ( 8.2)	716 (6.8)	1723 (16.4)	1459 (13.8)	5778 (54.8)	10543 (100)
1980	1193 (13.1)	712 (7.8)	898 ( 9.9)	1210 (13.3)	5097 (55.9)	9110 (100)
1981	588 ( 6.8)	683 (7.9)	760 ( 8.8)	1801 (20.9)	4799 (55.6)	8631 (100)
1982	876 ( 7.1)	703 (5.7)	901 ( 7.2)	2258 (18.2)	7673 (61.8)	12411 (100)
1983	739 ( 7.3)	491 (4.9)	956 ( 9.5)	2041 (20.3)	5842 (58.0)	10069 (100)
1984	370 ( 3.8)	552 (5.7)	1203 (12.4)	2164 (22.2)	5435 (55.9)	9724 (100)
1985	247 ( 2.4)	386 (3.7)	1729 (16.7)	2220 (21.4)	5787 (55.8)	10369 (100)

Source: Vector Borne Disease Control Programme, Ministry of Health.

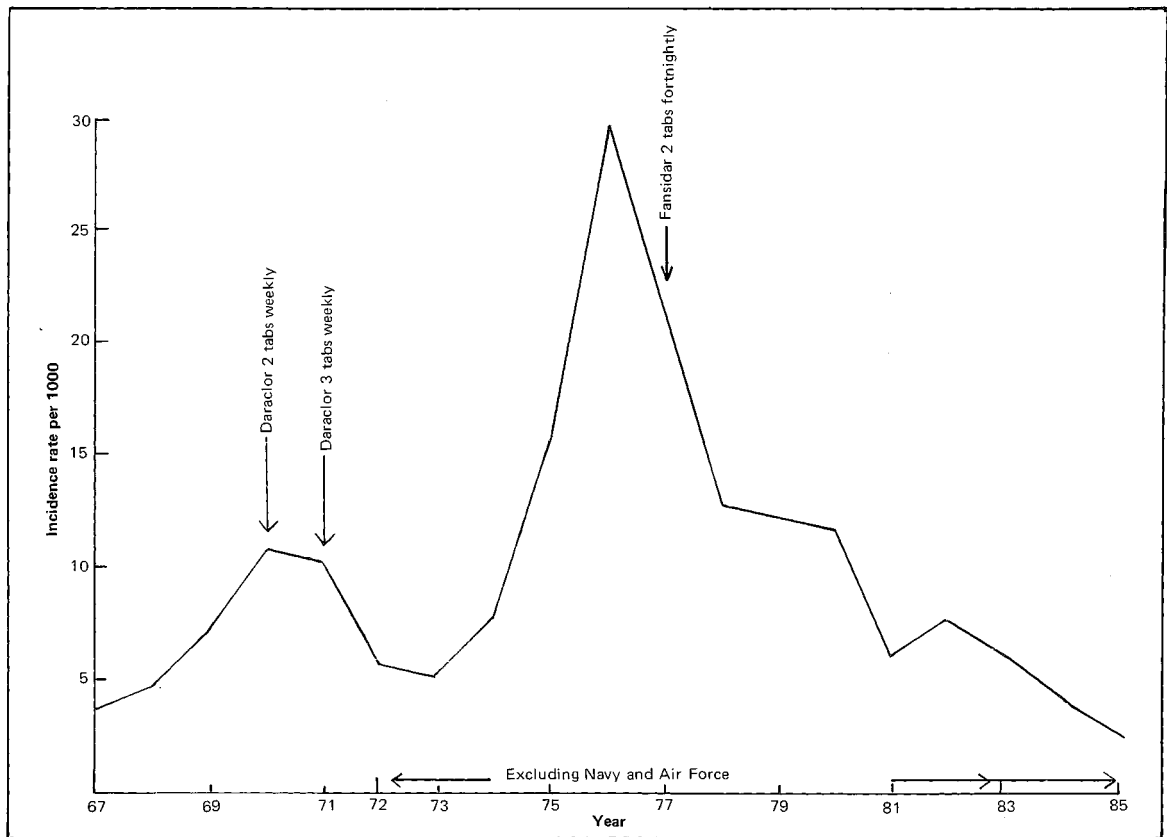


FIG. 1 MALARIA-ANNUAL INCIDENCE RATE PER 1000 SERVICEMAN, 1967 – 1985.

In January-February 1977, our soldiers suffered heavily from malaria while operating in South Thailand due to chloroquine-resistant strains of *P. falciparum*. In March 1977, Fansidar (fixed combination of 500mg sulphadoxine and 25mg pyrimethamine per tablet), two tablets fortnightly, were introduced and the incidence dropped dramatically.<sup>6</sup> A field trial in 1978/1979 comparing the effectiveness of three tablets of Fansidar as a single monthly dose to one tablet of Daraclor on alternate days confirmed Fansidar's superiority and became the drug of choice for chemosuppression.<sup>7</sup> However, it was not introduced throughout Malaysia as Fansidar-resistance was reported especially in neighbouring Thailand.<sup>8</sup> It was adopted for use only in areas where chloroquine-resistant strains were present such as the Malaysia-Thai border areas so as to prevent the rapid emergence of Fansidar-resistant strains of *P. falciparum*. The dosage was later changed to two fortnightly<sup>9</sup> and since 1985 to one weekly.

## Mortality

Only 12 soldiers died from malaria during the period 1972 to 1985.

## Distribution of cases by species

Table II shows the proportion of cases due to different parasite species among soldiers over the years. The percentage of *P. falciparum* has fluctuated between 41% to 82%, while *P. vivax* ranged from 9% to 58%. In the 1970s and till 1982, *P. falciparum* was the predominant species with a ratio of three falciparum to one vivax. In 1983 the ratio narrowed to 1.2 : 1 and equalled in 1984, a reversal of the trend for the first time. The Peninsular Malaysia figures reflect a similar trend, that of *P. vivax* becoming the dominant species and this is cause for concern as this is more difficult to control.<sup>3</sup> Very few cases of *P. malariae* have been reported.

**TABLE II**  
**DISTRIBUTION OF MALARIA PARASITE SPECIES BY PERCENTAGE IN MALAYSIAN SOLDIERS (1970 – 1985)**

Parasite	1970	1972	1974	1976	1978	1980	1982	1983	1984	1985
<i>P. falciparum</i>	60.5	66.0	66.0	82.4	75.5	63.6	76.3	54.4	48.4	41.4
<i>P. vivax</i>	36.8	28.3	30.6	9.4	22.7	35.5	32.3	44.8	48.9	58.6
<i>P. malariae</i>	—	—	—	—	—	0.1	—	—	—	—
Mixed ( <i>P. falciparum</i> + <i>P. malariae</i> )	1.5	3.5	2.8	1.6	0.7	0.7	0.4	0.8	2.7	0
Not specified	1.2	2.2	0.6	6.6	1.1	0.1	—	—	—	—

Source: Medical Directorate, Ministry of Defence.

### Distribution of cases by state

Fig. 2 shows the distribution of cases in Malaysia for 1985. Sixty-one cases originated from Perak, followed by 36 cases in Sabah, 35 in Pahang and 34 in Johore. Kelantan contributed 19 cases and Melaka 15 cases. In Perak, most of the cases were due to *P. vivax*, a ratio of three vivax to one falciparum and in Pahang it was 2:1. In Sabah, Johore and Kelantan, falciparum cases predominate. The states bordering Thailand contributed 82% of the cases.

### DISCUSSION

The incidence of malaria is dependent upon the interaction between the host (soldier), agent (parasite) and the vector (mosquito) in the local environment. The soldier's chief weapon in the field is the chemoprophylactic, the choice of which is based on effectiveness, cost, availability, acceptance and the local epidemiological pattern of malaria. However, to date, there is no ideal

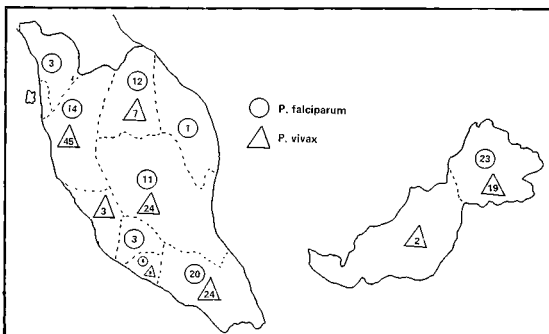


FIG. 2. Map showing distribution of malaria cases among soldiers, 1985.

chemoprophylactic providing 100% protection against malaria. In the Malaysian Armed Forces, three different drug regimens have been used over the years namely Paludrine, Daraclor and Fansidar. Proguanil hydrochloride was the first suppressive used but was changed to Daraclor in 1962 as it was cheaper, easier drug supervision as it was a weekly dose and proguanil resistance was appearing.<sup>10</sup> Proguanil resistance, though present, was not widespread nor alarming at that time. It is currently used as a chemoprophylactic by New Zealand soldiers.

One of the earliest studies of Daraclor was on Ghanaian soldiers in 1960 which showed it to be highly effective in suppressing malaria.<sup>11</sup> Our experience with Daraclor for over 20 years under field conditions was similar in areas where chloroquine-resistant strains of *P. falciparum* was absent. The increase over time from one to two and then to three tablets of Daraclor has mainly been to overcome relative parasite resistance. It has been successful, going by the incidence after the introduction of new regimes. Moreover, no problems such as chloroquine retinopathy have been encountered in any of our soldiers at current dosage levels.

Fansidar has been used only since 1977 and has shown itself to be an effective chemoprophylactic. Initially, the dosage was three tablets once monthly. Later it was changed to two every fortnight<sup>9</sup> and is now one tablet weekly as per the World Health Organization recommendation in areas where resistance of *P. falciparum* to chloroquine is pronounced.<sup>12</sup> Its use has, to

date, not resulted in any side-effects. Unfortunately, Fansidar-resistant *P. falciparum* has now been reported in Thailand,<sup>8</sup> Malaysia<sup>13</sup> and Indonesia<sup>14</sup> and is cause for concern. Fansidar use is being limited to soldiers on field operations in chloroquine-resistant areas only. Prophylaxis also ceases while in base camps. With these precautions, it is hoped to keep side-effects (severe skin reactions including fatalities have been reported<sup>15</sup>) and resistance developing at a low level. The drawback with Fansidar use is its lack of protecting against infection with *P. vivax* and *P. malariae*<sup>12</sup> and can be noted in Fig. 2 from the large number of vivax malaria in Perak and Pahang. Though breakthroughs by vivax can be safely managed there is a need to review our prophylaxis to provide safer and more effective protection from both vivax and falciparum infections.

There are other drugs available as prophylactics and are used by soldiers of other countries. Singapore has used all the three prophylactics we have used and are now on Maloprim (pyrimethamine and dapsone combined).<sup>16</sup> The Indian Army uses 300 mg chloroquine phosphate base weekly,<sup>17</sup> the Bangladesh Army chloroquine 600mg and primaquine 15mg weekly,<sup>18</sup> and Ghanaian soldiers 20mg chlorproguanil weekly.<sup>19</sup> Mefloquine has been shown to be effective for therapy with and without Fansidar<sup>20</sup> and chemoprophylaxis,<sup>21</sup> though resistance has been reported in the Philippines and Thailand.<sup>22</sup> Ginghaosu and other drugs are under study for their therapeutic and prophylactic role.<sup>23</sup> However, "the history of drug resistance in falciparum malaria suggests that these compounds may also enjoy only a short-lived glory and that cross-resistance with related compounds can be expected".<sup>24</sup> The development of a vaccine, expectations of which are high, would bring us nearer to the goal of global eradication of malaria.

"Malaria discipline is absolutely necessary to the army's success in fighting the Plasmodium-mosquito axis".<sup>25</sup> The discipline involves compliance with regard to the regular consumption of the drug besides measures that prevent contact with mosquitoes such as use of mosquito nets and insect repellents. Compliance is a problem

among all soldiers whether Malaysian, Australian or American. Many studies have shown outbreaks of malaria resulting from breach of discipline in taking regular chemoprophylactics.<sup>26</sup> In a study of Malaysian soldiers in 1973, nearly 50% failed to take their chemoprophylactics regularly.<sup>27</sup> The dispensing of the tablets at parades is the best way of ensuring compliance as per current regulations.<sup>28</sup>

Chemoprophylactics does not prevent malaria infection but only suppresses clinical infection. Hence other methods of control in the base such as destruction of mosquitoes, personal protection, screening for carriers, adequate and appropriate treatment and follow-up of malaria cases are all vital in the fight against malaria.<sup>29</sup>

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