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MALARIA IN THE PROVINCE OF TAKEO, CAMBODIA

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Abstract. Malaria was studied in the province of Takeo, Cambodia. In the hyperendemic region of Kirivong district, 49 (46.0 %) of 105 suspected patients were found to be infected, 98 % of them with *Plasmodium falciparum* and 2.0 % with *P. vivax*. The highest prevalence (85.7 %) was recorded in the group of 15-20-year-old patients. A total of 296 patients were examined in the hospital of Takeo during one year (1983—1984) and 77 (26.0 %) of them were positive. *P. falciparum* infection was found in 76.6 % and *P. vivax* in 23.4 % of cases. The highest prevalence (42.3 %) was also in the age-group of 15—20 years. The "7-day test" was used in vivo in 15 patients in order to detect the sensitivity of *P. falciparum* to Fansidar. The asexual forms of parasites disappeared within 4 days, while the gametocytes survived in two patients until 7th and 8th day, respectively. The observations could not be terminated, since the two patients will fully left the hospital.

Cambodia People's Republic, like other countries of South-East Asia, belongs to endemic regions of malaria. The most frequent malaria species is *Plasmodium falciparum*, whereas *P. ovale* has not been recorded in this country. All eradication programmes, using mostly DDT spraying, brought only partial results. In 1969, there lived 2,200,000 inhabitants in the malaria zone (Chhea Thaing 1973). Cambodia was one of the first countries of the world in which the resistance of *P. falciparum* to chloroquine was reported. In 1962, one of the two isolated strains of *P. falciparum* used for the infection of a non-immune volunteer exhibited the resistance to chloroquine at the level of R I. Four years later, even R II resistance was demonstrated in vitro and in vivo experiment.

All control measures against malaria were stopped with the beginning of the regime of terror of Pol Pot in 1975. During the four years of his regime the inhabitants moved in masses from the lowlands, where malaria occurred only sporadically, to hyperendemic mountain regions. This resulted in malaria epidemics among the non-immune population from lowlands. After the defeat of Pol Pot in 1979 the people returned to the lowland provinces where foci of malaria arose due to gametocyte carriers. According to Bun Chan Boun Som (1979), 1,500,000 persons of the 5 million inhabitants of Cambodia are exposed to the hazard of malaria.

As it has been recently reported from South-East Asia, some strains of *P. falciparum* are resistant to Fansidar (Sulfadoxine + Pyrimethamine) (Black et al. 1980, MMWR 1980). Höfler (1980) recorded the resistance to Fansidar in a *P. falciparum* strain originating from Cambodia territory, probably from the vicinity of Thailand-Cambodia border.

The problem of malaria was studied from three points of view during my one-year's stay at the Hospital of Czechoslovak-Cambodian Friendship in the province of Takeo (1983—1984):

1. prevalence of malaria in the district of Kirivong as a hyperendemic region of malaria, at Vietnam-Cambodia border,
2. occurrence of malaria in patients in the hospital of Takeo,
3. sensitivity of *P. falciparum* to Fansidar.

Table 1. Results of examination for malaria in three villages in the district of Kirivong

Age-group	No. of patients examined	Men / Women	Positive %	Species of *Plasmodium*	
				falciparum	*vivax*
0—5 years	17	12 5	6—35.2 %	6	0
6—9 years	10	3 7	4—40.4 %	4	0
10—14 years	22	12 10	14—63.6 %	13	1
15—19 years	7	1 6	6—85.7 %	6	0
20—30 years	12	4 8	5—41.6 %	5	0
> 30 years	37	17 20	14—37.8 %	14	0
Total	105	49—46.6 % 56—53.4 %	49—46.6 %	48—98.0 %	1—2.0 %

MATERIAL AND METHODS

A total of 105 patients from three villages of the district of Kirivong were examined for malaria. The blood was taken from those who had a subjective feeling of fever and weakness. The hepatospleenic index was not determined from important objective reasons.

An indication for the examination of both in- and out-patients were clinical symptoms of *Plasmodium* infection. The diagnosis was made from a thick drop and blood smear stained with Giemsa.

The in vivo test of sensitivity of *P. falciparum* to Fansidar was performed after WHO recommendation (Tech. Rep. No. 529, 1973) using the so-called "7-day test". Fansidar was applied in standard doses, i.e. 3 tablets or two intramuscular injections (1 tablet or 1 injection contain 500 mg of sulfadoxine and 25 mg of pyrimethamine). Before treatment, no chemoprophylaxis or other antimalarials were applied in the patients. The quantification of parasitaemia was not made either at the beginning or in the course of the test.

RESULTS

Malaria in the district of Kirivong

Among the 105 patients examined for malaria, 49 (46.6 %) were found to be infected (Table 1). The infection occurred more frequently in women than in men (57.2 : 42.8 %). The highest prevalence was recorded in the age-group of 15—19 years. The dominant species was *P. falciparum* (98.0 %) whereas *P. vivax* was identified only in 2.0 % of patients.

Malaria in the hospital of Takeo

During one year, a total of 296 patients were examined for malaria and 77 (26.0 %) of them were found to be infected. *P. falciparum* occurred in 76.6 % and *P. vivax* in 23.4 % of cases. The highest number of suspected cases was examined in November, i.e. in the rainy season (36.6 % positivity), and the highest percentage of positive cases (38.0 %) occurred in February (Table 2).

Table 2. Results of examination of malaria in Takeo hospital laboratory

Months 1983—1984	Number of patients examined	Number and % of positive cases	Species of *Plasmodium*	
			falciparum	*vivax*
March	7	0	0	0
April	2	1	1	0
May	15	5—33.0 %	4	1
June	29	6—20.7 %	5	1
July	17	6—35.3 %	4	2
August	37	4—10.8 %	0	4
September	27	6—22.2 %	3	3
October	38	11—28.9 %	8	3
November	71	26—36.6 %	26	0
December	22	3—13.6 %	2	1
January	10	1—10.0 %	1	0
February	21	8—38.0 %	5	3
Total	296	77—26.0 %	59—76.6 %	18—23.4 %

The highest prevalence of malaria was found in the age-group of 15—19 years (42.3 %); 63.0 % of all patients were younger than 30 years. The majority of cases came from the district of Kirivong or from the woody areas of the provinces. Only in single cases it might be supposed that the infection was acquired in the lowlands (Table 3).

Table 3. Age distribution of positive cases examined for malaria in Takeo hospital laboratory

Age-group	Total No. of cases		Species of *Plasmodium*	
	examined	positive	*falciparum*	*vivax*
0—5 years	35	6—17.1 %	3	3
6—9 years	19	0	0	0
10—14 years	25	4—16.0 %	2	0
15—19 years	26	11—42.3 %	11	0
20—30 years	89	28—31.5 %	15	9
> 30 years	102	28—27.5 %	23	3
Total	296	77—26.0 %	59	18

Sensitivity of *P. falciparum* to Fansidar

Asexual forms of *P. falciparum* disappeared from all patients during 4 days. The gametocytes persisted in two of them up to day 9 after the beginning of the therapy. Then further observations had to be stopped, since the patients wilfully left the hospital as soon as the fever dropped and their health condition improved (Table 4).

Table 4. Survival of asexual stages of *Plasmodium falciparum* in the peripheral blood after Fansidar treatment

Day after beginning of therapy	Asexual stages disappeared (No. patients)	Gametocytes survived (No. patients)	Form of Fansidar application	
			inj.	tbl.
Day 1	0			
Day 2	5		2	3
Day 3	6		1	5
Day 4	2		2	0
Day 5				
Day 6				
Day 7		1*		1
Day 8				
Day 9		1*		1
Total	15	15	5	10

* The observations were not terminated, since the patient will fully left the hospital.

In 15 examined patients the diagnosis was made on the basis of the finding of merozoites (rings) (13 ×), merozoites and gametocytes (1×) or gametocytes only (1×). In the two cases of long-term survival of gametocytes, the diagnosis in one case was based on the finding of rings which disappeared after 4 days and then there appeared gametocytes, which persisted up to day 7. In the other case, only rings were found in the preparation, which disappeared on day 2 after the beginning of treatment, but gametocytes appeared on the same day and persisted up to day 9, when the observations were terminated.

DISCUSSION

All data on malaria in Cambodia between the years 1975—1979 are lacking. As late as in 1979, Pham Huy Dung published a survey of cases diagnosed in the hospitals of Phnom Penh. The percentage of positivity ranged from 1.6 to 18.7 %. Ho Bun Hon (1979) detected by an in vivo test R I and R II resistance of *P. falciparum* to Fansidar even in 40 % of patients.

No data on the prevalence of malaria in individual provinces, based on laboratory diagnostics, are available for the time being. Our results are the first published report based on the laboratory diagnostics, and show that the prevalence of malaria is high in the endemic region. Also the 26.0 % positivity to malaria in the hospitalized patients is high. Buck et al. (1983) reported the highest prevalence of malaria to be 17.7 % in the age-group of 20—24 years in the hospital of Manila (Philippines), whereas in our studies, there were 42.3 % of positive cases in the group of 15-19-year-old patients.

We observed all clinical forms of malaria tropica. In the test of sensitivity of *P. falciparum*, with the exception of Fansidar only, the most common therapeutic scheme was Fansidar + tetracycline + quinine. No decreased sensitivity of asexual forms of *P. falciparum* to Fansidar was observed in our test in vivo. The fever dropped immediately after the asexual erythrocytic forms of *P. falciparum* had disappeared from the peripheral blood. In the patients, in which the gametocytes survived for a long time in the peripheral blood, the fever dropped immediately after the disappearance of asexual forms from the peripheral blood and the general health condition immediately restored.

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МАЛЯРИЯ В ПРОВИНЦИИ ТАКЕО (КАМБОДЖА)

М. Гибода

Резюме. Изучали малярию в провинции Такео в Камбодже. В гиперэндемической области района Кириконг 49 (46,6 %) из 105 обследованных больных было заражено; 98 % из них видом *P. falciparum* и 2 % видом *P. vivax*. Самая высокая встречаемость (85,7 %) была отмечена в группе больных в возрасте 15—20 лет. В больнице города Такео было обследовано в течение одного года (1983—84) 296 больных. Среди 77 (26 %) положительных случаев 76,6 % было заражено видом *P. falciparum* и 23,4 % видом *P. vivax*. Самая высокая встречаемость заражения (42,3 %) наблюдалась также у больных в возрасте 15—20 лет. Чувствительность *P. falciparum* к Фансидару изучали у 15 больных с помощью „7-дневного теста" in vivo. Бесполые формы исчезали у всех больных в течение 4 дней, тогда как гаметоциты переживали 7 или 9 дней. Наблюдения невозможно было довести до конца из-за самовольного отхода обоих больных из больницы.

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