

MALARIA SURVEILLANCE AMONG THE DISPLACED KAREN POPULATION IN THAILAND APRIL 1984 TO FEBRUARY 1989, MAE SOT, THAILAND

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Abstract. Right from the arrival of the displaced Karen people in Thailand, Médecins sans Frontières (MSF) identified malaria as the top priority problem. A program of patient care based on the coupled laboratory/dispensary was set up in April 1984. Immediately a system of surveillance of morbidity and mortality from malaria was set up. This study consisted of analysing data gathered over a period of five years. During this time, the displaced population increased from 9,000 to 20,000. Analysis of the trends shows a hyperendemic situation with an annual incidence rate of 1,067 per thousand in 1984. This figure was 600 per thousand in 1988. 1,500 blood smears were checked each month and the positive predictive value of clinical suspicion was 45% on average. *Plasmodium falciparum* represented 80% of infections. The malaria case fatality ratio over the course of the last two years of surveillance was 0.3%. Five years observation show that the fight against malaria in this region can be based on the development of curative services and laboratories.

INTRODUCTION

Since 1984, following the conflicts inside Burma, 20,000 Karen people, coming from mainly malaria hyperendemic zones, were displaced in Thailand and gathered in the rain forest along the border in the north of Mae Sot, Tak Province.

Right from their arrival, Médecins sans Frontières organised a medical aid program. In 1984, malaria accounted for more than 40% of consultations given to these displaced populations. The annual incidence rate rose to 1,037 per thousand with 80% of the cases due to *Plasmodium falciparum*. The medical program gave priority to the fight against malaria and used the dispensary coupled with the laboratory as the main weapon in this fight.

Fourteen dispensaries are spread over the eight camps. Karen health workers, supervised by MSF personnel, give daily consultations. Four laboratories examine all the blood samples from the camps. Three of these laboratories are set up in camps with more than 2,000 people, and the last is in the main camp which has a population over 6,000. The laboratories are supervised by MSF staff who carry out regular quality control checks.

The data collected over five years of surveillance of malaria in this exceptional context have been analysed. It allowed us to study the trends of the disease in the Karen camps and to measure the impact of both preventive and curative measures implemented.

Background

Endemic malaria is a major public health problem in Thailand with an annual incidence rate of 8 per thousand in 1977 (Prasittisuk, 1985) and 6, 3 per thousand in 1987 (Malikul, 1988). An extensive health program to combat malaria has been developed in the whole country since 1951. In 1971 the program was reinforced: malaria clinics were set up and areas were sprayed with insecticides. These clinical centers have played a major part in the global strategy to reduce the morbidity and mortality due to malaria (Harinasuta, 1987). In the Mae Sot area, on the Thai-Burmese border, the annual incidence rate was 194 per thousand in 1985 and 146 per thousand the following year. Fifty percent of the cases were due to *P. falciparum* (Ettling *et al*, 1989a, b). Environmental, political and social factors added to the difficulties of combatting the vectors in this area and ensured the continuance of high incidence. Malaria in Mae Sot

area is characterized by permanent transmission throughout the year with two peaks in July/August and December. *P. falciparum* predominates and is resistant to chloroquine in more than 95% of cases. This infectious agent becomes less and less sensitive to sulfadoxine-pyrimethamine. The principal vectors are *Anopheles minimus* and *An. dirus* (Ettling *et al.*, 1989a, b).

MATERIALS AND METHODS

The study of trends over the five years from April 84 to February 89 was based on data collected every month from the dispensaries and the laboratories. The population figures were supplied by the Karen authorities in the camps.

A malaria case was defined as any person suffering from fever and/or shivering and/or nausea, and showing asexual forms of *Plasmodium* in the peripheral blood.

In the camps without a laboratory and in the entire zone before 1985, a blood smear was automatically taken from all patients showing malaria symptoms. In the absence of contra-indications, quinine (30 mg/kg) and tetracycline (25 mg/kg) for 7 days were prescribed. The slide was read afterwards in the laboratory. The cases confirmed by blood test were summarized as opposed to the patients with negative blood test who received presumptive treatment.

In the camps where there was a laboratory, treatment depended on the examination of the blood test. In the presence of asexual forms of *Plasmodium* in the peripheral blood, the patient was given MSP treatment (mefloquine-sulfadoxine-pyrimethamine) 15 mg/kg in a single dose (national protocol) since July 1985. Pregnant women, severe cases of malaria and those with contra-indications were excluded from this protocol. When *P. vivax* was present, chloroquine was always used (25 mg/kg over three days).

Malaria mortality was defined as anyone dying following a confirmation by the laboratory of malaria symptoms. Monthly and annual incidence rates were calculated. Mortality rates for 1987 and 1988 were then analysed. The data were entered on a microcomputer. Rainfall statistics were given by the meteorological services of the province.

RESULTS

The population under study grew steadily from 9,000 to 20,000 over the five years. Those under 5 always represented 15-16% of the population. The monthly number of consultations grew from 2,000 to 6,000 over the same period.

Morbidity

Morbidity was studied from April 1984 to February 1989. On average 12,000 cases of malaria were treated each year. The annual incidence dropped from 1,037 to 600 per thousand between 1984 and 1989. For children under five years old the figure declined from 1,600 to 760 per thousand during this period and for the population aged five or more from 900 to 600 per thousand (Fig 1). Monthly incidence and seasonal variations are shown in Fig 2. Two seasonal peaks were identifiable: one in December and the other in July and August.

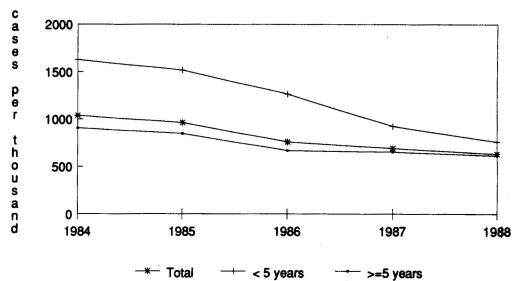


Fig 1—Malaria annual incidence among the displaced Karen population in Thailand, 1984-1988.

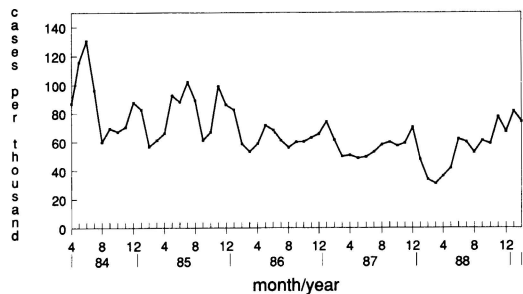


Fig 2—Malaria monthly incidence among the displaced Karen population in Thailand, April 1984-February 1989.

Mortality

The mortality figures show that among the 184 deaths recorded in 1987 (mortality rate 9.9/thousand/year) 44 were due to malaria (24%), with a specific mortality rate of 2.4 per thousand per year. In 1988 the specific mortality rate remained stable at 2/thousand/year. For children less than 5 years old the specific mortality rate for malaria was 6 per thousand in 1987 and 4 per thousand in 1988. For those 5 years old or more the mortality rate remained stable at 1.7 per thousand per year (Table 1).

Case fatality ratio

The case fatality ratio was 0.34% in 1987 and 0.31% in 1988. For children under 5 years old the figures were 0.65% and 0.54% respectively.

Laboratory data

The laboratories recorded statistics from their opening in July 1984. Between 1,000 and 1,700 blood smears were examined each month and, on average, 12% of the population was checked each month in a laboratory following a consultation (5-18%). The laboratory activities followed the seasonal changes. Among the cases of malaria suspected by clinical signs, the positive predictive value of clinical diagnosis calculated for 5 years was 45%. The PPV fluctuated seasonally from 32% to 68% parallel at the incidence rate confirmed by the laboratory's tests (Fig 3). In 1985, out of 13,262 clinical cases 6,510 cases (49%) were confirmed by the laboratory. In 1988, 7,044 cases out of 18,399 (38%) were positive.

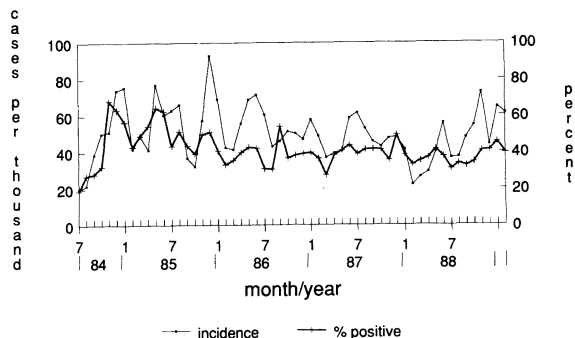


Fig 3—Malaria monthly incidence and percentage of positive smears, Karen population. Thailand, July 84-Feb 89.

From 1984 to 1988 the percentage of cases treated following laboratory results climbed from 45% to 87%. Fig 4 shows the evolution of the incidence rate of confirmed cases and the incidence rate of cases treated (confirmed and presumptive).

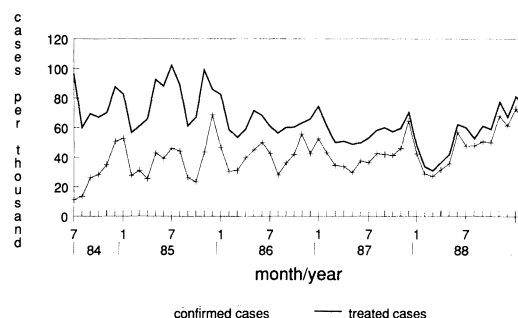


Fig 4—Treated malaria cases and cases confirmed by the laboratory, Karen population. Thailand, July 84-Feb 89.

Table 1

Malaria case fatality ratio, specific mortality rate and proportional mortality by age, 1987-1988.

	Case fatality ratio (%)			Specific mortality (%)			Proportional mortality (%)		
	< 5 years	≥ 5 years	Total	< 5 years	≥ 5 years	Total	< 5 years	≥ 5 years	Total
1987	0.65	0.27	0.34	6	1.7	2.4	20	26	24
1988	0.54	0.23	0.31	4	1.7	2	12	29	21

Source : MSF

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The distribution of plasmodial species shows that *P. falciparum* was responsible for 76% of infections. This percentage varied from 65% to 89% according to the season. The monthly ratio of *P. falciparum* to *P. vivax* ranged from 10.6 to 1.3 (Fig 5). It was higher during the yearly periods of high transmission. This ratio declined progressively to reach an average of 3.5 in 1988.

Environment

In 1986 the annual rainfall was 1,300 mm of water and the incidence of malaria was calculated at 759 per thousand. In the following year 1,630 mm of rain fell, and the incidence of malaria was 692 per thousand.

DISCUSSION

Analysis of the trends over five years shows a drop in the incidence of malaria in the Karen camps.

The dispensaries, the only medical structures in the isolated camps, are easily accessible, the consultations and the treatment are free, so the data collected at this level shows an acceptable picture of morbidity in the camps.

One hypothesis concerning the drop in incidence rests on the development of curative services which ensure an early diagnosis and appropriate treatment. The fall in annual incidence is particularly noticeable for children under five. This section of the population is stable, doesn't

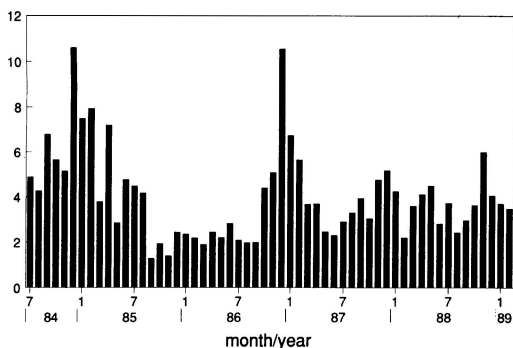


Fig 5—Monthly ratio *P. falciparum*/*P. vivax*, Karen population, Thailand, July 84-Feb 89.

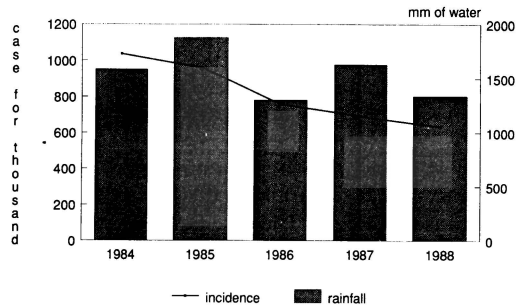


Fig 6—Malaria annual incidence and annual rainfall Karen population, Thailand, 1984-1988.

move around and is also more receptive to both curative and preventive programs. The mothers could easily take their children to the dispensaries and were more willing to use mosquito nets for their children.

It is also reasonable to suppose that, over the five years, the camps themselves changed. The growth in population and the construction of new living quarters brought with it a spacing out of the vegetation and an improvement in sanitation. Moreover the vectors, *An. dirus* and *An. minimus* have a growing tendency to become exophilic and exophagic (Kondrashin, 1986). For those aged 5 years or more the annual incidence dropped but less so. This slight drop might be due to the mobility of this group. They frequently moved across the border to hyperendemic zones to work on the land or to engage in commercial or other activities. This situation does not seem to be related to climatological factors (Fig 6).

The analysis of monthly incidence shows that transmission occurs throughout the year. However, as has been shown in other areas of Thailand (Harinasuta *et al*, 1982), the incidence is bimodal with transmission peaks in the rainy season and in December at the beginning of the dry season. These peaks are particularly marked in 1984 and 1985.

The rise in incidence at the beginning of 1989 was unusual for this time of the year. It was due to the arrival of a number of new refugees, creating a rise in the number of new cases when population figures had not been updated by the camp authorities.

Mortality from malaria is high among children below the age of 5. Preventive action should be

aimed at this high risk group. The whole population, in fact, is seriously affected if we compare it to the Thai population where the specific mortality was 3.9 per 100,000 for 1986 (Malikul, 1988).

The analysis of the proportional mortality rates shows that malaria remains one of the principal causes of death. The case fatality ratio is low owing to the increased number of benign cases detected and the improvement in the care of patients by better trained personnel in early diagnosis and therapeutic procedures.

Analysis of the laboratory results confirms the high rate of malaria in this population. Of the 12% of the population checked each month, 45% shows positive blood test. The Pf/Pv ratio is also very much higher than in other Thai zones (Meek, 1988). Among the clinically diagnosed cases the percentage of positive smears runs parallel to the incidence rate. This can be seen as a good indicator of the incidence in the hyperendemic regions where the laboratory results can serve as a warning system for the epidemiological situation.

The monthly incidence confirmed in the laboratory approaches the incidence of cases treated from December 1987. This date coincided with the opening of the fourth laboratory, and consequently the drop in the proportion of cases receiving presumptive treatment unconfirmed by the laboratory. This finding shows that at this date the majority of the population was able to benefit from the optimum antimalaria treatment available, ie MSP. The quinine-tetracycline treatment is difficult to supervise and the observance is poor because the treatment is over a seven day period. MSP is easily administered, it has a wide tolerance and was 99.7% efficient in 1986 (Nosten *et al*, 1987). MSP treatment is possible if it can count on the presence of reliable laboratories in this situation of multiresistant falciparum malaria.

The cost of MSP treatment is the same as Q7T7 treatment. Only the budget of the laboratory service must be taken into consideration. It is difficult to evaluate, however, because it is part of the normal resources of a MSF mission.

Because of population movement, we cannot determine if the introduction of the MSP brought about a significant drop in the transmission of malaria in the camps. A drop in the Pf/Pv ratio was noted however.

CONCLUSION

Five years of surveillance of malaria in the Karen camps show that despite a drop in the incidence rate, the fight against malaria is still a priority. The development of curative services and the installation of laboratories seems to be an efficient way of reducing morbidity and mortality on the ground. Besides, this system safeguards immunity and minimises pressure on the plasmodial strains compared with a strategy of presumptive treatment.

ACKNOWLEDGEMENTS

We would like to thank the MSF teams who worked on this program, the Karen personnel and the Malaria Zone Office of Tak Province in Thailand.

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