A STUDY ON SOME ASPECTS OF THE EPIDEMIOLOGY OF MALARIA IN AN ENDEMIC DISTRICT IN NORTHERN PENINSULAR MALAYSIA NEAR THAILAND BORDER

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Abstract. A study on the distribution of malaria in Hulu Perak district, Peninsular Malaysia was carried out between January and December 1993. The study encompassed the distribution of malaria cases according to sex, age and profession. A total of 332 cases were recorded, with 182 cases occurring in males. The highest infection was observed in the above 15 years old age group. Forest workers (loggers, rattan collectors and forest product gatherers) were the group most exposed to the disease (32.8%), followed by both plantantion workers (32.2%) and aboriginal communities (32.2%). Army and police personnels (2.1%) were also infected. *Plasmodium falciparum* was the most common species of malaria in the area.

INTRODUCTION

Malaria still remains an important arthropod-borne disease in Malaysia. Most of the malaria cases reported are from the more remote areas from various states in the country, more so in areas with limited infrastructure. Most of these Malaysian States are involved with the opening up of new lands either for agriculture or the extensive construction of the north-south and east-west Highways of the country. Such activities provide suitable breeding sites for vectors that breed prolifically in such places (Sandosham and Thomas, 1982).

The present research was carried out to study the distribution of malaria in the Hulu Perak district, Peninsular Malaysia in relation to age, sex and professions of the infected population.

MATERIALS AND METHODS

The study was carried out in Hulu Perak district, an area in the State of Perak, Malaysia. The district is endemic for malaria where more than 50% of malaria cases from the State of Perak comes from this district. The district covers an area of 6657.9 km^2 with 90% of it being covered with tropical rain forests and hills. In 1989, the total population of the district was about 90,000. Most of the populace grows paddy, fruit-trees, taps rubber or are forest product gatherers, especially rattan.

Thick and thin blood films were obtained for a period of 12 consecutive months beginning January until December 1993 from villagers using standard procedures (WHO, 1975). The blood films were stained with Giemsa (Bruce-Chwatt, 1961) and examined for *Plasmodium* using standard procedures (Bruce-Chwatt, 1961); between 3-5 minutes were spent on each thick film (700 x magnification in oil immersion) before it is declared positive or negative.

Blood collections were carried out according to both passive (PCD) and active (ACD) case detection. In the PCD method, blood films were only obtained when the villager comes to the clinic for treatment when unwell, whilst in the ACD method, visits were made to villages to carry out and collect blood films. These visits were carried out once a month, and drugs (quinine dihydrochloride 10 mg/kg body weight) were given orally for 7 days to those positive for malaria.

RESULTS

From a total of 48,182 slides collected using the PCD and ACD methods, 332 (0.68%) were positive with malaria (Fig 1). Mean number of cases per month was 27.7. The highest number of cases was 47 (14.16%), observed in August, whilst the lowest was 15 (4.52%), observed in both in the months of March and December.

More males (182) than females (150) were posi-

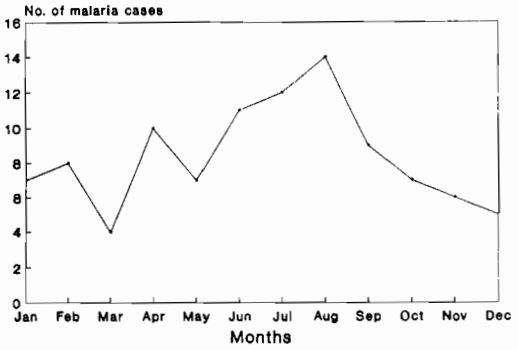

Fig 1–Showing the number of malaria cases occurring monthly at the Hulu Perak district, Malaysia during 1993.

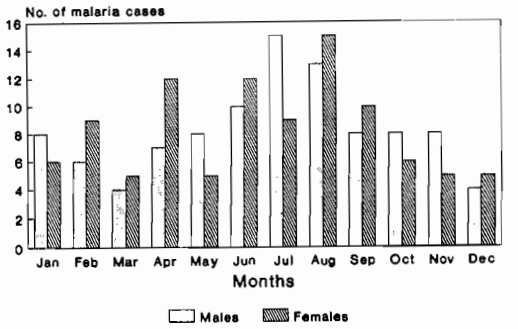

Fig 2–Showing the number of malaria cases occurring in males and females in the Hulu Perak district, Malaysia during 1993.

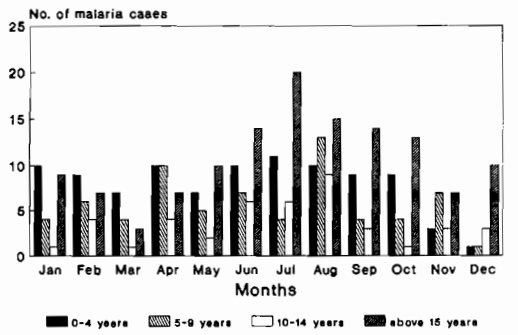

Fig 3–Showing the number of malaria cases occurring monthly at the Hulu Perak district, Malaysia for various age groups during 1993.

tive for malaria (Fig 2). In males, the highest number of cases (27,14.48%) was seen in July and the lowest both in March and December (8,4.39%). For females, the highest number of cases was observed in August (23, 15.33%) and the lowest both in March and December (7,4.67%). However, analysis of data using Student's *t*-tests showed that there is no significant difference (t=1, 16, p = 0.25) in infection between males and females.

Fig 3 shows that the highest number of positives occurred in the above 15 year-old age group (129 cases, 38.86%), followed by the 0-4 (91, 27.41%), 5-9 (69, 20.7%) and 10-14 year-old (43, 12.95%) age groups respectively.

Fig 4 shows the distribution of malaria in the various professional groups of the population. Forest workers (loggers, rattan collectors and forest product gatherers) were the group most exposed to the disease (32.8%), followed by both the plantation workers (32.2%) and the aboriginal communities (32.2%). Army and police personnel accounted for a total of 2.64% of the totals positive for malaria.

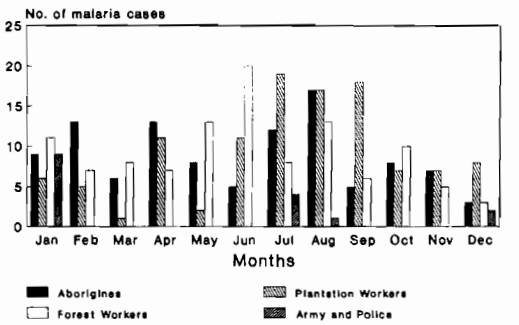

Fig 4–Showing the number of malaria cases occurring monthly at the Hulu Perak district, Malaysia for various professional groups during 1993.

The dominant malaria species was *P. falciparum,* follwed by *P. vivax.* Mixed infections were observed during some months of the study period. *Plasmodium falciparum* is responsible for 229 cases of malaria, whereas *P. vivax* accounted for 97 malaria cases. There were 6 mixed infections during the duration of the study.

DISCUSSION

The detection of 332 malaria cases in the Hulu Perak district in the year 1993 showed a significant reduction when compared to previous years. In 1992 and 1991, 832 and 603 cases were reported respectively (Gerik Health Centre, Malaysian Ministry of Health, 1993). The reduction was probably due to control measures introduced in the Malaria Control Programme which was started in 1969, which included the detection of cases, a central management of drug administration, spraying of DDT 25% at the rate of 2 g/m^2 once in 6 months (Rashid *et al,* 1992). Other measures such as locating larval breeding sites and flushing of drains has helped reduced the transmission (Rahman *et al,* personal observations).

The study showed that males were more likely to be infected than females, more so those obove 15 years old who worked as land settlers, rubber tappers, loggers, farmers or themselves were the aborigines. The daily activities of these groups continuously expose themselves to the bites of mosquito vectors which may result in the disease. The work place of these groups are often located in jungles where trees are cut for logs and agriculture. These activities create new habitats suitable for the breeding of *Anopheles maculatus,* the main vector of malaria for the area (Rahman *et al,* 1990). According to Foong (1991), malaria in populations that have variable working activities is difficult to control because they probably get infected at their respective working places. In Thailand population movements in and out of jungles because of logging activities is the main problem in controlling malaria (Ketrangsee, 1991). Similarly in other countries like Indonesia, loggers in Kalimantan, Sulawesi, Irian Jaya and Sumatra remained the highest group of people to be infected with malaria (Marwoto, 1991).

Areas involved in land development schemes, either old or new, will face serious malaria problems. Lands which had been cleared will promote breeding places for *An. maculatus* (Sandosham, 1970), the main reason being why many pioneer land settlers were infected with malaria. Furthermore, land development schemes often require foreign workers with low immunities towards malaria (Foong, 1991; Marwoto, 1991; Ketrangsee, 1991). They often live in temporary shelters, often near to vector breeding places. Their daily activities after work also encourages man-vector contacts; they will rest outside houses at dusk and expose their bodies towards mosquito bites (Arasu, 1992). This phenomenon was clearly shown to occur in the State of Johor in 1985, whereby malaria cases rose when compared to previous years. The entry of foreign laborers in land development schemes in the state has resulted in an increase of malaria during the year (Anonymous, 1985). The same was also reported in the state of Sabah, whereby the entry of laborers from the neighboring country is seen as one of the reasons why malaria could not be controlled (Uma and Chee, 1988). In a separate study carried out in Thailand by Svannadabba (1991), it was reported that the increase in the number of malaria cases in 4 provinces from 1985 until 1987 was caused by the cutting of trees and the entry of workers from other provinces for activities related to coffee planting.

The Malaysian aborigines of the Hulu Perak district and other areas are often infected with malaria (Polunin, 1953; Wharton *et al,* 1963; Bolton, 1972). Arasu (1992) showed that population and economical factors (these people live in remote hilly areas and forests were cleared for planting of hill paddy which will create many new breeding sites) contribute towards the increase of malaria infections amongst the aborigines. However, the number of malaria cases in the aborigines is estimated to be higher than reported in this study and that of others, because a lot of cases were not reported at all. Furthermore, the Gerik Health Center is not able to extend its malaria control activities to include the villages of the aborigines which are often too remote. Moreover some groups of the aborigines still live a sedentary way of life, and they move around looking for food in the jungles (Foong, 1991). Army and Jungle Police personnels were constantly given an adequate supply of drugs to combat malaria, and this may explain the low infection rate amongst them, despite their free movements in the jungles.

High infection rates in the above 15 year-old age groups suggested differences in exposure as a result of occupational activities carried out by this group which are associated with various forest activities like logging, rattan collecting, etc (IMR, 1983). Furthermore adults with a bigger body size will produce or possess more mosquito attraction factors like body odor and carbon dioxide (McIver, 1968; Lenehan, 1984). In the study area children are exposed to mosquito bites during night time before entering into mosquito nets. Moreover,

Quranic classes are held at night, and often they stay at the open verandahs and exposed themselves to mosquito bites. Children have a low immunity towards malaria, and this may explain some cases of malaria in the present study.

In conclusion, it can be said that in the Hulu Perak district, the occurrence of malaria is often associated with occupational factors and population movements. Males, especially those above 15 years old remained as the highest age group to be infected because their daily occupational activities often relate to the jungles especially in newly-opened lands that breed *An. maculatus,* the vector for the disease. Thus control measures taken need to emphasize this age group because they are more exposed to malaria than the other age groups.

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