

Hibernation of the Malaria Parasite in Bahrain

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ABSTRACT

During 1985, 327 cases of imported malaria were reported; of which 279 (85%) were studied. Most cases were Indians and Pakistanis infected with *Plasmodium vivax* with characteristically prolonged incubation periods.

At present, there is no evidence of malaria transmission in Bahrain. The last indigenous case having occurred in 1979¹. A single induced case occurred each in 1982 and 1983. Prolonged incubation periods have been reported in patients with *P. vivax* infections^{2,3} and this study was intended to examine this phenomenon in Bahrain.

METHODS

Fever occurring among Asian expatriates is suggestive of malaria. Blood smearing for malaria is routinely carried out at the Health Centres, the Salmaniya Medical Centre, and the Public Health Laboratory. Cases are investigated by a health inspector, and home and neighbourhood contacts are screened for malaria parasites.

RESULTS

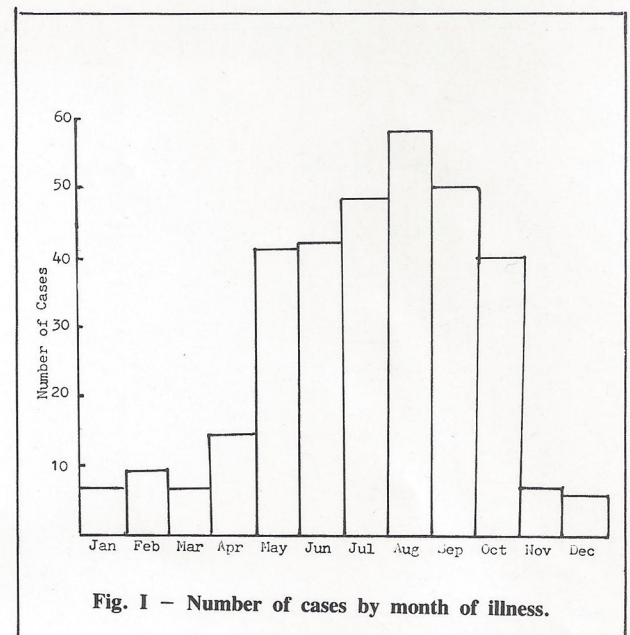
During 1985, 327 malaria cases were reported; all were imported. With the exception of 13 cases of *P. falciparum* malaria, all cases were due to *P. vivax*, mostly from India and Pakistan⁴.

Of the 327 cases, 279 (85%) were studied. Among the latter were 252 males and 27 females, 84% of the cases were in the 21-50 years age group (Table 1).

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Age Group	No. of Cases	%
0 - 14 yrs	26	9.3
16 - 20 yrs	15	5.4
21 - 30 yrs	147	52.7
31 - 40 yrs	68	24.4
41 - 50 yrs	19	6.8
51 + yrs	4	1.4
Total	279	100



Out of the 327 cases, 293 (90%) were ill between April and October, while 34 (10%) were ill from November to March (Fig. 1). Of 279 studied cases, 123 (44%) developed fever within 4 months of arrival in Bahrain, 144 (52%) became ill between the 4th and the 12th months and 12 (4%) after one year

of arrival (Table 2). Those arriving in the spring and summer developed malaria within 4 months of arrival, while those arriving in winter became ill after 4 months of arrival and during the next summer months (Table 3, Fig. 2).

DISCUSSION

With the influx of expatriates from malarious areas into Bahrain from the year 1976 onwards, there was a marked increase in the incidence of malaria. The average number of malaria cases reported per year for the three 5 year periods 1971-75, 1976-80 and 1981-85 were 88, 429, and 310 respectively. The peak incidence throughout this period occurred during the summer months i.e. May - October (Annual Reports, PHD) ¹.

In India, the maximum prevalence of malaria is usually from July to November ⁵. Hence, importation of malaria cases from areas of high endemicity into Bahrain is likely. Movement of population is an important factor in the epidemiology of malaria ⁵.

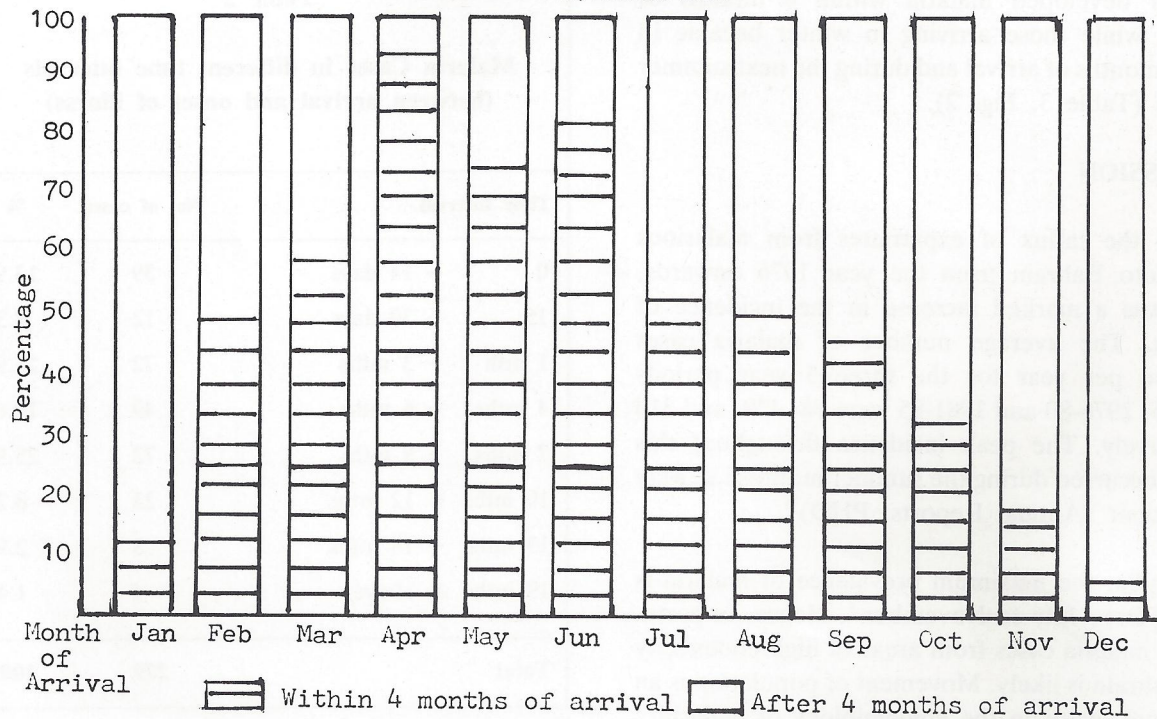
Time Interval	No. of cases	%
0 - 14 days	39	13.9
15 - 30 days	12	4.3
1 mth - 3 mths	72	25.9
4 mths - 6 mths	49	17.6
7 mths - 9 mths	72	25.9
10 mths - 12 mths	23	8.2
13 mths - 18 mths	8	2.9
19 mths & above	4	1.4
Total	279	100

Table 3

Distribution of Subjects by Month of Arrival and Falling Ill
either within or after four months of arrival in Bahrain 1985

Month of Arrival	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SUBJECTS FALLING ILL												
Within 4 mths of arrival												
Number	3	8	15	18	13	15	7	15	16	10	4	1
Percent	(12)	(50)	(60)	(95)	(76)	(83)	(54)	(52)	(47)	(32)	(19)	(6)
After 4 mths of Arrival												
Number	22	8	10	1	4	3	6	14	18	21	17	15
Percent	(88)	(50)	(40)	(5)	(24)	(17)	(46)	(48)	(53)	(68)	(81)	(94)
TOTAL SUBJECTS												
Number	25	16	25	19	17	18	13	29	34	31	21	16
Percent	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

Fig. II - Percentage of Subjects Falling Ill with Malaria within/after 4 months of arrival, Bahrain 1985.



The low incidence in the winter months i.e. November - March is attributable to the low ambient temperatures which limit vector transmission in Bahrain. Shute's and Maryon's observations as quoted in Warwick et al. ² were that a temperature persistently above a minimum of 23.9°C is required for sporozoite maturation. In winter, the low ambient temperature inhibits the growth of the parasite in the human host and the parasite appears to be in a state of hibernation.

Prolonged incubation periods longer than four months were found in 156 (56%) out of 279 cases. This was observed in cases arriving in Bahrain during winter.

Recently, it was shown that some sporozoites inoculated by mosquitoes fail to develop after entering liver cells but remain dormant and begin to divide months to years after the bite causing relapses ⁶. Relapses occur only in *P.vivax* and *P.ovale*. Different strains of *P.vivax* have their own characteristic patterns of relapses. Some strains relapse months after the primary attack; others may take six months or longer, or may not have a primary attack ⁶. Consequently it has been named *P.vivax hibernans* by some ³.

Two explanations have been put forward by malariologists. Nicolaev quoted in Warwick et al. ², proposed that there were two strains of *P.vivax* with different incubation times. Recent studies suggest that the different incubation periods depend on the numerical proportion of two strains of sporozoites i.e. tachy sporozoites and brady sporozoites ³. Shute's study as quoted in Warwick et al. ², stated that the incubation period varied with the sporozoite dosage in the infective bite. Long incubation periods were attributed to very small numbers of injected sporozoites. Relapses may occur under conditions of stress, that cause a depression of the acquired immunity. Such conditions include excessive work, intercurrent diseases, surgical operations and pregnancy ^{7,8}.

The predisposing factors leading to clinical attacks of malaria among expatriates are many. Further research is needed to determine contributing factors that may precipitate clinical attacks of malaria among individuals from malarious areas.

CONCLUSION

Prolonged incubation periods can be expected to be seen among expatriates from malarious areas.

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