

Imported malaria infections diagnosed at the malaria referral laboratory in Riyadh, Saudi Arabia

Ibrahim S. Alkhalife, MSPH, PhD.

ABSTRACT

Objective: To determine epidemiological characteristics of imported malaria infections in Riyadh, Kingdom of Saudi Arabia, based on retrospective analysis of laboratory records within the Central Laboratory.

Method: Records of the Malaria Referral Laboratory in Riyadh, Kingdom of Saudi Arabia (KSA) were reviewed for the past 6 years: 1416-1421 Hejri inclusive (1996-2001 Gregorian). The dates of blood films were converted to Gregorian calendar in addition to the Hejri dates already used in the records. Data collected included the date of film, age, sex, nationality and parasitological findings in the film. All data was entered and analyzed using statistical package for social sciences computer software.

Results: The annual mean number of positive slides was 212 ± 78 . Positive slides were reported at the rate of 18 /100,000 among 137,402 potential blood donors screened during this period. The overall slide positivity was 12.9%

among suspected cases referred from hospitals and 9.5% among those referred from health centers and private clinics. Most positive slides were from Saudis (36.6%), Sudanese (30.9%), Indians (13.9%), Pakistanis (8%) and Yemenis (5%). The type of malaria infection varied in the different nationalities, reflecting the pattern of endemicity at the source of infection. Positive cases show a marked seasonality in Saudis, reflection seasonal transmission of the disease in the endemic areas.

Conclusions: Although there is no active malaria transmission in Riyadh KSA, imported infections still poses a significant health problem. A high index of suspicion should be maintained in those with suggestive travel history. Efforts to reduce the incidence of transfusion malaria should aim at formulation of appropriate policies for selection of blood donors and for screening of blood.

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Active malaria transmission in the Kingdom of Saudi Arabia (KSA) is currently limited to endemic areas in the South and SouthWest, mainly in Gizan Province. In the capital Riyadh, there is no active mosquito transmission of malaria due to the temperature extremes that do not favour mosquito breeding.¹ However, the city is inhabited by a large number of expatriates some of whom might be malaria carriers on their arrival or might import the disease during vacation travel abroad. Saudi nationals resident in Riyadh could also get exposed to

malaria during visits to endemic areas or during travel to endemic areas within the KSA. Moreover there is active population movement within KSA, with large numbers of people from endemic areas in the South and SouthWestern parts of KSA migrating to Riyadh. Thus, in the absence of active malaria transmission, the cases of malaria reported in Riyadh health facilities represent "imported" cases. The term "imported" includes cases imported from outside KSA as well as cases acquired due to residence in or travel to endemic areas within

From the Department of Pathology, College of Medicine, King Saud University, Riyadh, *Kingdom of Saudi Arabia*.

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Address correspondence and reprint request to: Dr. Ibrahim S. Alkhalife, Department of Pathology, College of Medicine, King Saud University, PO Box 2925, Riyadh 11461, *Kingdom of Saudi Arabia*. Tel. +966 (1) 4671013. Fax. +966 (1) 4672462. E-mail: ikhalife@ksu.edu.sa

KSA. Malaria is resurgent in most tropical countries and the risk to travelers is increasing. Each year 25-30 million people from non-tropical countries visit areas in which malaria is endemic, of whom between 10,000 and 30,000 contract malaria. Ninety per cent of travelers who contract malaria do not become ill until after they return home.² Studies in the Gulf States underlined the significance of imported malaria in the Kuwait³⁻⁵ and Emirates.⁶

The Malaria Unit of the Central Laboratory in Riyadh acts as the referral malaria laboratory for the health facilities in Riyadh area. The laboratory receives suspected malaria cases referred from health centers and private clinics and hospitals and it also screens potential blood donors in the Central Laboratory. There are other clinical laboratories that examine blood films for malaria in Riyadh; however, the Central Laboratory receives the bulk of the cases in the area of its coverage. Moreover, although data collected in such a setting could be missing some significant clinical parameters, we believe that a great deal of useful epidemiological data could be obtained from analysis of the laboratory records. The present study was conducted to elucidate epidemiological aspects of imported malaria in Riyadh from these records.

Methods. Laboratory records of the Malaria Unit of the Central Laboratory, Riyadh for the period 1416-1421 Hejri inclusive (1996-2001 Gregorian) were reviewed. The dates of blood films were converted to Gregorian calendar in addition to the Hejri dates already used in the records. The number of blood films examined and positive films reported in each month during the study period were noted. Data collected about positive films included the following: date of film, age, sex, nationality and parasitological findings in the film. All data was

entered and analyzed using statistical package for social sciences computer software.

Results. Table 1 shows the number of cases detected in potential blood donors and in suspected malaria cases tested during the period of the study. A total of 1272 positive malaria films were reported, with an annual average of 212 positive films (SD=78). Among suspected malaria cases the slide positivity rate was 12.9% for those referred from hospitals and 9.5% for those referred from health centers and private clinics. The distribution of positive blood films by nationality is shown in Table 2. Most of positive cases (95%) belonged to five nationalities: Saudis, Sudanese, Yemenis, Indians and Pakistanis. Table 3 shows the type of malaria infection in these five nationalities. The annual incidence of positive films among potential blood donors ranged between 0% to 0.045% with a mean of 0.018%. Of a total of 25 potential donors with positive blood films for malaria, 13 (52%) were Saudis and the rest were other nationalities, Table 4. Monthly distribution of positive cases according to Gregorian Calendar and by nationality is shown in Figure 1. An annual peak of incidence occurred during the period from February to April. A smaller peak followed in September through to November.

Discussion. Imported malaria presents a serious medical and public health problem. When such cases occur in non-endemic settings they tend to be missed and diagnosed at a late stage after the disease has progressed to severe and complicated malaria. While the mean annual number of reported positive slides is 212 ± 78 , there is a general trend for a lower annual number of positive slides. This trend could partially be explained by a reduction in the number of referrals from

Table 1 - Number of blood films examined and positive films for malaria in blood tests carried out in the Malaria Unit Central Laboratory during the period 1415-1421.

Year	Examined	Blood Banks			Examined	Hospitals			Health Centers and Private Clinics				Total +ve
		+ve	-ve	+ve%		+ve	-ve	+ve%	Examined	+ve	-ve	+ve%	
1416	20439	0	20439	0	1879	171	1708	9.1	544	49	495	9.1	220
1417	21632	5	21627	0.023	1172	199	973	16	582	79	503	13.6	283
1418	22136	10	22126	0.045	1249	233	1016	18.7	628	70	558	11.2	313
1419	23604	4	23600	0.017	1133	147	986	13	656	48	608	7.3	199
1420	24639	1	24638	0.004	857	103	754	12	580	49	531	8.4	153
1421	24952	5	24947	0.02	773	57	716	7.4	560	42	518	7.5	104
Total	137402	25	137377	0.018	7063	910	6153	12.9	3550	337	3213	9.5	1272*

*Mean=212, SD=78

Table 2 - Distribution of positive films by nationality of persons tested.

Nationality	Positive films n (%)
Saudi	465 (36.6)
Sudanese	393 (30.9)
Indian	177 (13.9)
Pakistani	102 (8)
Yemeni	72 (5.6)
Other	63 (5)
Total	1272 (100)

Table 3 - Type of malaria infection by nationality.

Type of infection Nationality	Plasmodium vivax Asexual stages with or without gametocytes	Plasmodium falciparum			Total Falciparum	Mixed infections	Total
		Asexual stages only	Gametocytes +asexual stages	Gametocytes only			
Saudi	58 (12.5)	233	121	50	404 (87.1)	2 (0.4)	464
Sudanese	181 (46.1)	104	69	35	208 (52.9)	4 (1)	393
Pakistani	94 (92.2)	3	5	-	8 (7.8)	-	102
Indian	156 (88.1)	9	10	2	21 (11.9)	-	177
Yemeni	17 (23.6)	26	13	17	56 (76.4)	-	73
Total	506 (41.9)	375	218	104	697 (57.6)	6 (0.5)	1209

Table 4 - Potential blood donors in whom malaria was detected by blood film, distributed by nationality.

Nationality	n
Saudi	13
Sudanese	5
Pakistani	2
Malian	2
Sri Lankan	1
Yemeni	1
South African	1

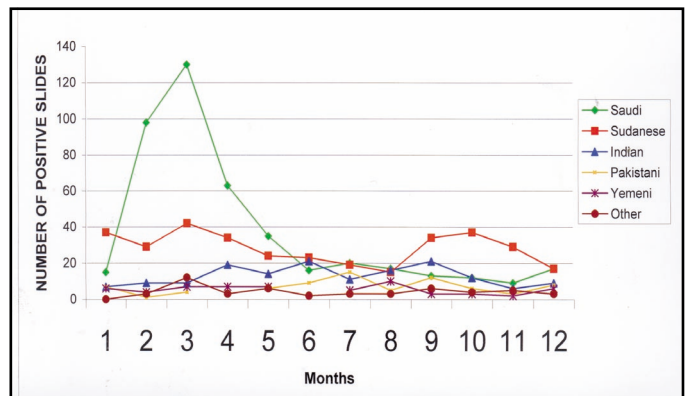


Figure 1 - Total number of positive slides in each month, 1996-2000, by nationality.

hospitals probably because hospitals are becoming increasingly self-reliant in malaria microscopy. The numbers of cases referred from health centers and private clinics do not show significant changes. The numbers of potential donors show a steady increase due to expansion of health services and demand on blood banks during this period. A particularly higher rate of slide positivity occurred in 1418 (1998). This could be explained by the malaria epidemic that swept through the endemic areas in the Gizan and neighboring Yemen.

Most of positive slides were from 5 nationalities: Saudis, Sudanese, Indians, Pakistanis and Yemenis. Positive Saudis are likely to have been exposed during travel to or recent migration from endemic areas in the South and SouthWest of the KSA. The other nationalities come from countries where malaria is endemic. The type of malaria detected in blood films shows patterns characteristic to the home country of the person tested. Saudis are predominantly infected with *Plasmodium falciparum* (*Plas.falciparum*) this the predominant species of malaria in KSA.⁷⁻¹⁰ Most of Saudis had asexual stages of malaria in the blood film indicating acute malaria. The pattern of infection among Sudanese is markedly different from the known relative prevalence of malaria species in that country. Although *Plas.falciparum* infection is reported to account for about 90% of cases in Sudan,⁷ we find a high proportion of infections with *P.vivax* detected in the present sample. This could be due to the fact that in an area where cases are predominantly *P.falciparum*, cases with *P.vivax* are not given anti-relapse treatment as routine. This could lead to a higher representation of *P.vivax* when they move to a non-endemic area like Riyadh. The pattern in Yemeni cases is more or less similar to that in Saudis. *Plasmodium Vivax* is the predominant species in Indian and Pakistani subjects, this is expected because it is the predominant species of malaria in their respective home countries.^{7,11} The peak of malaria incidence during the period from February to April is particularly marked among Saudis. It could be explained by the pattern of malaria transmission in KSA, which generally follows the rainy season. The second smaller peak occurring after September is mainly contributed by Sudanese and could be explained by imported cases of malaria among returnees from annual summer vacation. A similar pattern of seasonality has been noted by Bashwari et al⁸ who reported that 40% of cases in a series of hospitalized malaria patients in the Eastern Region of KSA occurred during the months of February, March and September. In another series in Jeddah most of hospitalized malaria cases were reported to have presented during the period of December through to April.⁹

Asymptomatic as well as symptomatic carriers of imported malaria may act as a source of transmission of infection either due to abuse of syringes or through blood transfusion. Cases of transfusion malaria have been reported from a number of hospitals in Riyadh.^{1,10,12}

In one incident nosocomial transmission of malaria to a number of cases in Riyadh had been attributed to a contaminated heparin bottle or heparin locks.^{13,14} In the present data, of 137,402 screened potential blood donors malaria was detected in 25 persons. This is equivalent to 0.018% or 18 per 100000 persons screened. This number does not represent the actual risk because blood film examination may not detect asymptomatic parasitemia, since the parasites may be little in number.¹⁵ This has led to evaluation of serologic tests like indirect fluorescent antibody test (IFAT)¹⁶ or enzyme linked immunoassay,¹⁷ immunochromatographic antigen detection tests¹⁸⁻²⁰ and, more recently polymerase chain reaction to detect submicroscopic parasitemia.²¹⁻²⁵ The value of such screening tests in the contest of selection of blood donors in Riyadh would have to be considered in the context of epidemiological parameters in the area. Regulations governing the acceptance of donors of whole blood for transfusion vary considerably from one country to another. Different countries adopt different policies according to their special circumstances.^{26,27} To prevent transfusion malaria 2 measures have to be taken: 1. Exclusion of potential donors with high risk of carrying malaria. 2. Screening of blood donors suspected on circumstantial evidence of harboring malaria parasites in their blood. If strict exclusion of potential donors who were born or lived or visited an area endemic for malaria is followed, this will no doubt compromise blood supplies, as was the experience of the United States of America, back in the 1970s.²⁶ On the other hand, relaxation of strict exclusion criteria will compromise blood safety, unless sensitive and specific malaria screening tests can be added to an already expanding list of microbiological screening tests. The time is now ripe to undertake population-based epidemiological studies, including potential blood donors, which will provide the basis for formulation of a policy of donor selection/screening that would reduce the risk of transfusion malaria in KSA and particularly in non-endemic areas like Riyadh.

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