



## Species-dependent Clinical Findings of Malaria Caused by Various Plasmodia in an Endemic Area of Kerman Province, Southeastern Iran

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### Abstract

**Background:** Malaria is a big problem of public health in many tropical countries where socioeconomic development is deficient. Four species of plasmodium are capable of infecting human: *P. falciparum*, *P. malariae*, *P. vivax*, *P. ovale*. Southeastern corner of Iran, including Sistan and Baluchestan, Hormozgan and the tropical part of Kerman Province, are endemic region of malaria. This study aimed to find out clinical findings in malaria caused by various plasmodium species in moderate transmission area of southern Kerman Province.

**Methods:** This study was conducted in health centers of Kahnooj, Manujan, Ghale-Ganj, Roudbar and Fariab in south of Kerman Province, Southeastern Iran during 2005-2009. Three hundred and thirty patients with positive malaria parasite slides entered the study. Frequencies of several malaria clinical presentations were investigated in four plasmodium species.

**Results:** 54.2% of considered patients were male. Mean age of patients was  $22.8 \pm 17.8$  yr. Younger and older patient were 6 months and 80 yr, respectively. Ten patients were infected with *P. falciparum*, 314 with plasmodium vivax and 6 with mixed infection. The symptoms of fever, chills and sweating were present in 74.6% of subjects. Other complaints were joint pain, headache, fatigue, vomiting, and diarrhea. Splenomegaly was detected in 17.57% of the individuals.

**Conclusion:** Malaria should be considered in differential diagnosis of all acutely febrile patients in endemic area. Classic symptoms of fever, chills and sweating may not present in all of patients.

**Keywords:** Malaria, Clinical finding, Iran

### Introduction

Malaria is the most important parasitic infection in the world that poses major health challenges. Despite years of continual efforts, this infection is still a threat to approximately 40% of the world's population in about 100 countries (1).

The disease is caused by plasmodium parasites and transmitted by female anopheles mosquitoes. Four species of malaria parasites cause this disease (*P. falciparum*, *P. vivax*, *P. malariae*, *P. ovale*).

This infection involves many organs and has several manifestations. Its impact varies due to epidemiological settings. Prompt diagnosis and early appropriate treatment, could improve the outcomes of patients and reduce the mortality of malaria infection (2).

Clinical features include fever, chills, sweating, headache, vomiting, diarrhea, abdominal pain, cough, splenomegaly and hepatomegaly (3-5). In

non-endemic area, fever is a good sign of malaria in children under 5 yr old (6). Clinical signs and symptoms, routine laboratory test, and travel history are helpful to differentiate of malaria from other febrile diseases (7). Combination of several signs and symptoms has higher positive predictive value to the diagnosis of malaria than each single of them (8). Malaria case definitions using only clinical manifestations are affected by the patient's age and endemicity of the geographic area (9). Patients from endemic area have significantly better response to drug therapy and prognosis in comparison to the patients from low malaria transmission regions (10). Asymptomatic malaria in endemic area is a big problem for malaria control program in these regions (11). Southeastern corner of Iran including Sistan and Baluchestanand, Hormozgan, and the tropical part of Kerman province are endemic region of malaria (12). In Iran, malaria is remaining as a public health problem (13). The main objective of this study was to determine the common clinical features in malaria caused by various Plasmodium species in south of Kerman province.

### Materials and Methods

This study was conducted in health centers of Kahnooj, Manujan, Ghale-Ganj, Roudbar and Fariab districts in south of Kerman Province, Southeastern Iran during 2005-2009. After obtaining informed consent, three hundred and thirty individuals with malaria infection were included in the study. Giemsa stained thick and thin blood smear were made from all of the subjects and examined according to the Basic Malaria Microscopy guide-

line (14). Clinical evaluation including fever, chills, sweating, vomiting, headache, diarrhea, abdominal pain, cough, herpes labialis, splenomegaly, and hepatomegaly were recorded. The collected data were analyzed through SPSS19 software (Chicago, IL, USA). Some quantitative and qualitative variables including central distribution indices, frequencies of various symptoms and signs and percentages were determined.

### Results

Overall, 179(54.2%) and 151(45%) were male and female, respectively. Mean age of patients was 22.8±17.8 yr old. Younger and older patient were 6 months and 80 yr, respectively. Ten patients were infected with *Plasmodium falciparum*, 314 of them with *Plasmodium vivax* and the rest had mixed infection of *P. vivax* and *P. falciparum* (Table 1). Classic triad of fever, chills and sweating were the leading clinical presentations in the three forms of infections and this triad was found in 80.84% of *P. vivax*and 50% of mixed infections while just in10% of the subjects with *P. falciparum*. Fever was the most symptoms in majority of the patients. Splenomegaly was the leading sign ranging from two to 23%. Herpes labialis was found in both *falciparum* and *vivax* infections ranging from 1% to 3%. This finding was not observed in mixed infections. Other main symptoms and sings were headache, chills, sweating, joint and bone pain, fatigue, hepatomegaly vomiting and diarrhea. Totally, 98% of the patients were treated as outpatient without any complication. More details are shown in Table 2.

**Table 1:** Various plasmodia species infection based on age and gender of patients

Plasmodia Parameters		<i>P. falciparum</i> (%) n=10(3.03)	<i>P. vivax</i> (%) n=314(95.15)	Mixed * (%) n=6(1.81)	Total (%) n=330(100)
Gender	Male	5(50)	171(54.45)	5(83.33)	181(54.84)
	Female	5(50)	143(45.54)	1(6.77)	149(45.15)
Range of ages yr		2-78	0.5-80	1-53	0.5-80
(Mean)		(23.2)	(22.8)	(23.9)	(22.8)

\*Mixed: *P. falciparum*+*P. vivax*

Table 2: Clinical findings in various plasmodia species infections

Plasmodia Symptoms	<i>P. falciparum</i> n (%)	<i>P. vivax</i> n (%)	Mixed n (%)	Total n (%)
Fever	7(70)	314(100)	6(100)	327(99.09)
Fatigue	1(10)	79(25.15)	1(16.66)	81(24.54)
Chills	6(60)	295(93.94)	3(50)	304(92.12)
Sweating	1(10)	251(79.93)	4(66.66)	256(77.57)
Classic triad*	1(10)	173(80.84)	3(50)	177(53.63)
Headache	3(30)	93(29.61)	5(83.33)	101(30.60)
Bone pain	3(30)	228(72.61)	4(66.66)	235(71.21)
Vomiting	1(10)	49(15.60)	2(33.33)	52(15.75)
Abdominal pain	0(0)	28(8.91)	0(0)	28(8.48)
Diarrhea	0(0)	28(8.91)	0(0)	28(8.48)
Cough	2(20)	31(9.87)	0(0)	33(10)
Pallor	0(0)	20(6.36)	1(16.66)	21(6.36)
Herpes labialis	1(10)	3(0.95)	0(0)	4(1.21)
Splenomegaly	0(0)	57(18.15)	1(16.66)	58(17.57)
Hepatomegaly	0(0)	17(5.41)	0(0)	17(5.15)
Jaundice	0(0)	20(6.36)	0(0)	20(6.06)
Hospitalized	3(30)	2(0.64)	1(16.67)	6(1.81)

\*Chills, fever and sweating

## Discussion

This study tried to elucidate the main clinical species-dependent symptoms of malaria infection based on the native strain of the parasites. In this study, almost all patients (98%) had uncomplicated malaria presented by fever, chills, headache, sweating, myalgia and joint pain such one other study that designed in Colombia (15) Pakistan and (16). Those results released by a number of authors from Zimbabwe, Thailand and some parts of Pakistan were comparable with those obtained from this study about *P. falciparum* symptoms (5, 17, 18). The main three signs in *P. vivax* of this study were the same with others (19). Vomiting was noted in 15% of patients infected with *P. vivax* and in 10% of *P. falciparum* infection that was significantly less than those were reported from Thailand with 37% of the infections (18).

Herpes labialis was found in both *falciparum* and *vivax* but not in mixed infection in this study similar to those results found others (16). In another study, this sign is reported only in *falciparum* cases (20).

Splenomegaly was recorded in 57% and 16% of patients with *P. vivax* and mixed infection, respectively. None of the *P. falciparum* infected patients had splenomegaly. This high proportion of splenomegaly in Kerman province is contrary to those reported from Quetta (5). Such discrepancy may explain due to repeat *vivax* malaria infection occurred among the studied patients. Mild splenomegaly was mostly reported with *P. vivax* (15). Hepatomegaly rate of *P. vivax* detected in our study was similar to those reported from Colombia (19), but dissimilar to those were in Thailand (18). This study highlighted some different clinical presentation due to different plasmodium species. Moreover, more study is required to show the relationship between clinical presentation and plasmodium species.

## Conclusion

Clinical presentations of various plasmodia species are almost similar in the most malarious areas in the world, but with some differences. In our study patients with *vivax* malaria infection

showed more classic clinical symptoms than either *falciparum* malaria or mixed infected patients.

## Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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