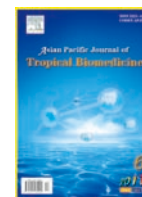




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## Prevalence of malaria infection in Sarbaz, Sistan and Bluchistan province

Youssefi Mohammad Reza, Rahimi Mohammad Taghi\*

Department of Parasitology, Islamic Azad University, Babol Branch, Iran

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## ABSTRACT

**Objective:** To survey malaria prevalence in Sarbaz from April 2009 to October 2010. **Methods:** Epidemiological data of 1 464 confirmed malarial patients were analyzed according to demographic status, sex, age, nationality, isolated species and residence place. **Results:** The majority of patients were male 950 (64.8%) but 514 (35.2%) were female. 82.5% of patients were Iranian, 14% Pakistani immigrants, and 3.5% Afghan immigrants. Data collected showed that 90% of isolated species were *Plasmodium vivax*, 7.8% *Plasmodium falciparum*, and 2.2% *Plasmodium malariae* and mixed species. **Conclusions:** Therefore, it is crystal clear that refugees should be prohibited by government and controlled by experts in health centers in order to campaign effectively with this life threatening disease.

## 1. Introduction

Malaria is one of the major global health problems and unfortunately, it has remarkable victims annually. Malaria is transmitted by female *Anopheles* mosquito<sup>[1]</sup>. Iran is located in the Eastern Mediterranean region and is one of the countries that face this problem. Before commencing any malaria control program in Iran approximately 60% of population of the country was living in endemic regions with 30% to 40% malaria morbidity<sup>[2]</sup>.

According to the epidemiology of disease, Iran has four different strata and southern part of this country is considered as malarial endemic regions<sup>[3]</sup>. More than 90% of malaria patients are reported from Sistan and Baluchistan, Kerman and Hormozgan Provinces in south-east of the Country<sup>[4]</sup>. In Iran, the prevalence rate of *Plasmodium vivax* (*P. vivax*) is more dominant compared with deadly *Plasmodium falciparum* (*P. falciparum*). Studies in 2008 indicate that out of 11 460 malaria cases of Iran, 8% were infected with *P. falciparum*, while 90% were due to *P. vivax*<sup>[5]</sup>.

The province of Sistan and Bluchistan is located at the south east of Iran and its neighbors Pakistan often sends

plenty of immigrants and refugees to our country. The aim of this study was to determine the prevalence rate, age and sex of malaria cases and isolated species from them documented in Public Health Center of Sarbaz from April 2009 to October 2010.

## 2. Materials and methods

The present descriptive study was carried out to demonstrate epidemiological feature of malaria in Sarbaz which is situated in Sistan and Bluchistan province, Iran. Sarbaz population is 144 442 and has 14 Health Centers and 95 Health Houses. Therefore, all episodes from April 2009 to October 2010 documented in Sarbaz Central Health Service (CHS) were precisely studied and reported.

In general, all suspected malaria patients were referred to Central Health Service located in the city of Sarbaz by physicians working in different clinics or hospitals. Then after collecting status information using questionnaire form by health service workers, one drop of blood was taken from patients' middle finger using a sterile lancet and placed on a clean microscopic slide from one end and spread on another slide to prepare an even smear. Following fixing with methanol and staining using Giemsa, the whole smear was carefully observed for any possible plasmodium species by an expert technician under light microscope<sup>[6]</sup>.

Positive specimens along with patients' related information were recorded and sent to Health Center located

\*Corresponding author: Mohammad Taghi Rahimi, Department of Veterinary Parasitology, Islamic Azad University, Babol Branch, Iran.

Tel: +989122930625

E-mail: rahimimt@gmail.com

at the center of Sarbaz. Meanwhile, patients were referred to infectious diseases specialist for further treatment.

### 3. Results

Overall, out of 61 169 studied samples 1 464 (2.4%) were positive. Our data showed that the highest infection rate was

related to *P. vivax* 1 327 (90.0%) compared with *P. falciparum* 114 (7.8%) and mixed infection 23 (2.2%). 82.5% were Iranian while 17.5% had other nationality comprising 14.0% Pakistani and 3.5% Afghans. 64.8% of the patients were male while 35.2% were female. Based on our findings the malaria cases in Sarbaz City were mainly coming from rural areas (91.0%). Comprehensive information about our study was shown in Table 1.

**Table 1**

Sex, age, nationality and residence place of malaria cases in Sarbaz, Sistan and Bluchistan Province, April 2009 to October 2010.

Total number of patients	Sex		Age groups			Nationality			Residence place	
	Male	Female	<5	5–14	>14	Iranian	Pakistani	Afghan	Urban	Rural
61 169	950	514	147	335	978	1 208	204	49	129	1 335
Percent (%)	64.8	35.2	10.0	22.9	66.1	82.5	14.0	3.5	9.0	91.0

### 4. Discussion

Sarbaz is located in Sistan and Bluchistan province. This province has one of the highest prevalence rates for malaria among provinces of Iran. The malaria endemic areas of Iran are located in the south east part of the country[5].

Analyzing the data collected from the current study indicates that the total number of malaria cases was 1 464 from April 2009 to October 2010. According to the data, malaria in men had a higher prevalence (64.8%) compared with women (35.2%) and it may be justified by more exposures to malaria vector in males due to their activities. According to our findings *P. vivax* was the main causative agent of malaria in Sarbaz (90.0%), followed by *P. falciparum* (7.8%).

In addition, a similar investigation performed in central Africa showed that 79% of the isolated malaria species were *P. vivax* followed by 21% *P. falciparum*[6]. Although many places in Iran reported that *P. vivax* is the most prevalent species, reports from some cities of Sistan and Bluchistan at the border of Pakistan shows the highest incidence rate of *P. falciparum* compared with other endemic regions of Iran[6]. Studies in 2008 indicate that out of 11 460 malaria cases of Iran, 8% were due to *P. falciparum*, while 90% were infected by *P. vivax*[5].

Hanafi–Bojd studied on Bandar Abas and found that the prevalence of malaria cases in villages was more than that of cities and also their team reported more than 97.6% of imported malaria cases while imported malaria cases in Sarbaz were 82.5%. This significant difference requires more study and it shows the important role of emigrants in Sarbaz[7–9]. Moreover, we cannot ignore the fact that Sarbaz sends plenty of workers to industrial poles and constructional projects. Khalili in Yazd province reported 77.3% of patients were Afghan immigrants and just 20.8% were Iranian[10].

Hence, there is no doubt that either obstruction of immigration of Afghan and Pakistan workers to Sarbaz or serious health control of refugees and anti-malarial campaign setup play prominent roles in prevention and control of malaria in this area and information on the epidemiology of malaria in Sarbaz is essential for designing and interpreting results of clinical trials of drugs, vaccines and other interventions.

### Conflict of interest statement

We declare that we have no conflict of interest.

### Acknowledgements

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