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## Epidemiological status of malaria in Iran, 2011–2014

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## ABSTRACT

**Objectives:** To aim to determine the status and epidemiological aspects of malaria in Iran in favour of gaining a better understanding of the national control of malaria.**Methods:** This epidemiological study examined the status of malaria from 2011 to 2014 in Iran. Data were collected from the Ministry of Health's protocol for controlling and eliminating malaria, which is currently in use. This malaria information reporting system is automated in all Iranian provinces and cities, and all information is submitted online to the center for communicable disease control in the Ministry of Health. Information about malaria is available for researchers to evaluate.**Results:** The incidence rates decreased from 2011 to 2014. There were 4.76, 2.12, 1.80, and 1.59 per 100000 people, respectively from 2011 to 2014. During the four-year period (2011–2014), the highest numbers of cases occurred in those aged 16–25 years, by age, and in men, by sex. Most of the cases were workers and located in rural areas. An average 52.58% of cases were Iranian. The highest incidence rates from 2011 to 2014 were located in Sistan and Baluchestan province. There were 89.94, 43.9, 38.3, and 30.66 per 100000 people. The highest numbers of malaria cases were recorded in the cities Sarbaz, Nickshahr, and Chabahar in Sistan and Baluchestan province and Bandar Abbas, Bandar Jask, and Bandar Lengeh in Hormozgan province. During the four-year period, 57.05% of cases were caused by imported factors. The majority of cases were related to the trophozoite lifecycle of parasites. Regarding surveillance, there was inactive care in the majority of cases. Vivax malaria was the most prevalent.**Conclusions:** Despite the recently declining trend in reported cases, the expansion of local transmission, especially in areas with cross-border travel, is very worrying. Improved malaria control interventions can be effective for elimination of malaria in Iran; these can include programs to control border travel and focused interventions for high incidence areas and high-risk groups such as rural residents, men, workers, and people <35 years old.

## 1. Introduction

Malaria is a global tropical and semi-tropical parasitic disease that is considered a major public health problem [1]. Malaria is a vector-borne disease caused by protozoan parasites that belong to the genus *Plasmodium*. The parasites are transmitted from

person to person by infected female anopheles mosquitoes [2]. According to the 2013 World Malaria Report by the World Health Organization (WHO), there were 207 million cases of malaria worldwide (uncertainty interval, 135–287 million) and 627000 deaths caused by malaria in 2012 [3]. Of the estimated 3.4 billion people that are at risk of malaria, 1.2 billion are at high risk. In high-risk areas, more than one malaria case occurs per 1000 population [4].

This disease remains an important cause of mortality and morbidity in many parts of the world, and it could have adverse health and socioeconomic impacts on the population [5]. The total international and domestic funding committed to malaria control was estimated to be US \$2.5 billion in 2012, which is substantially less than the amount that will be needed to reach

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the global targets [6]. Iran has a population of more than 75 million people and is located in West Asia. It covers an area of approximately 1.648 million km<sup>2</sup>, of which mountainous regions and arid deserts comprise 50% and 25%, respectively [7].

The first reports of malaria in Iran date back to 1921, when cases were found along the northern borders with Azerbaijan and the Caspian Sea [8]. In 1924, more than one-third of Iran's 13 million people had contracted malaria, and it was considered a deterrent to the economic development of the country [9,10]. Now, after more than 50 years of control interventions against malaria in Iran starting in 1956, malaria is still considered an acute health concern, particularly in the south and southeast of Iran [1]. In the Eastern Mediterranean Region, the Islamic Republic of Iran and Saudi Arabia are in the elimination phase. The number of indigenous cases decreased from 1710 in 2011 to 787 in 2012 (consisting of 756 indigenous, 12 introduced, and 19 suspected relapsing cases) [11]. Therefore, malaria is still prevalent in many areas [1,12].

The implementation of a regional strategic plan for controlling malaria is one of the most important reasons for the pre-elimination stage of malaria in Iran. WHO recommendations, including preventing the resettlement of pollution in malaria-free zones and eliminating the disease in areas where malaria transmission, are highly limited. Therefore, elimination of the disease and prevention of the return of malaria (re-introduction) in Iran, which is an endemic area, are of high importance. The elimination of the disease and prevention of the return of malaria (re-introduction) in a country where the disease is endemic is optimal. Therefore, three operational-technical approaches and four backup strategies to eliminate malaria have been proposed. The major strategies include: (1) Improving access to prompt and effective treatment of malaria; (2) Improving access to preventive services by strengthening integrated vector management (IVM); (3) Strengthening the disease surveillance system with an emphasis on appropriate and timely responses. And the backup strategies include: (1) Strengthening and developing a monitoring and evaluation system of interventions for malaria elimination; (2) Conducting applied research; (3) Using the capacity of all stakeholders for malaria elimination; (4) Building human capital capacity and mobilizing resources for malaria elimination [13].

Although previous efforts have reduced the disease burden in various areas, the malaria elimination program has faced several challenges because Iran borders malaria-prone countries. If malaria is not eliminated, economic development will be

threatened, and tourism and cultural-scientific and commercial exchange will be restricted in addition to the consequences of the disease burden. Hence, it is essential for policy makers to focus all of their efforts on malaria elimination. Understanding the aspects of the disease throughout the country is important for the national control of malaria [13]. This study aimed to evaluate the status of malaria and determine the various epidemiological aspects of the disease in Iran.

## 2. Materials and methods

This epidemiological study examined the status of malaria in Iran from 2011 to 2014. In this study, the data were collected from the Ministry of Health's protocol for controlling and eliminating malaria, which is currently in use. To find patients, we initially collected blood samples from people with suspected malaria. The samples were collected from health houses, urban and rural community health centres, public and private hospitals, and patio tables. In the patio table method, blood samples are collected by health professionals from people who have a fever or prior history of malaria to discover parasite carriers. Sampling was performed by health centre workers and disease control experts.

The samples were sent to laboratories under the supervision of the city health centres. The results of the sample analysis (active or passive) were submitted online to the center for communicable disease control in the Ministry of Health and Medical Education on a daily basis, within 12 h from sampling. The results of the analysis for active cases as well as the full details of the patients were reported monthly to the center for communicable disease control in the Ministry of Health by the unit fighting against diseases at the city health centre. The variables in this study included sex, age, place of residence, nationality, occupation, province, city, month, epidemiologic classification of cases, the parasite life stages, type of care, type of parasite, disease symptoms, travel history to contaminated areas, history of malaria for the past 12 months, history of malaria for the past 12 months, history of blood transfusion, intensity of malaria, treatment outcome, type of service, and result of the disease.

In this research, the data of intervention programs of CDC Iran's ministry of health and medical education has been used. All the ethics have been applied.

Malaria surveillance was conducted using two main methods: passive or active case finding (Table 1).

**Table 1**

Current malaria surveillance in Iran, including passive and active case finding.

	Passive surveillance	Routine	Active surveillance (Active foci)
Target group (for detection of blood smear)	People with fever, recent malaria cases (for follow up)	Suspected malaria cases, infected people in the interval between two case finding activities, foreign people (Afghani & Pakistani)	Persons who feel ill, were infected in the last month, with history of malaria, from other countries (Afghani & Pakistani)
Target regions	Nationwide	Households in the villages, mobile villagers in local malaria regions	Active foci (in urban areas and villages that have >50 households, around the reported cases; in villages with <50 households, the entire village)
Service centres	Malaria labs, health houses, hospitals	Health workers, mobile malaria team	Health workers, mobile malaria team
Remark		Active surveillance is usually conducted with an interval of two weeks, unless during transmission season, when it is conducted weekly. In areas with no malaria transmission, on a monthly basis	First active case detection is within 24 h of case detection and continued for four consequent weeks

Source of information: Raeisi *et al.* Determination of malaria epidemiological status in Iran's malarious areas as baseline information for implementation of malaria elimination program in Iran.

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