

## Epidemiological Pattern of Malarial Disease in the Province of Yazd, Iran (Since 1986-2006)

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**Abstract:** Yazd province which is the host of foreign immigrants may be faced contracting malaria. Epidemiological data of 4482 confirmed malarial patients were analyzed according to demographic status and isolated species. Among 4482 cases, 4257(95%) were male and 225(5%) female. 77.3% of patients were Afghan immigrants, 20.8% Iranian and 1.9% with other nationality. Data showed that 85.2% of isolated species were *P. vivax*, 13.7% *P. falciparum*, 0.1% *P. malariae* and mixed species. Results revealed that Yazd is not an endemic area and 80% of imported cases are immigrant from other area mainly Afghanistan.

**Key words:** Malaria • Yazd • Iran

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### INTRODUCTION

More than half of the world's population in approximately 100 countries is exposed to malaria. Iran is situated in the Eastern Mediterranean region, where about 45% of the population live with the risk of malaria [1]. The disease is most common in tropical and subtropical regions of the world but is established in some temperate climate as well [2].

Malaria caused by genus plasmodium is considered by many to be the most important infectious disease of human on the worldwide scale [2]. The four species of plasmodium that infect humans are *P. falciparum*, *P. vivax*, *P. malariae* and *P. ovale* [3]. The latest species was not reported in Islamic Republic of Iran [4].

Malaria was widespread in Iran in the past. In 1924, it was estimated that out of a population of 13 million, 4-5 million people had contracted disease [5]. As a result of the anti-malaria campaign started in 1951, malaria transmission was interrupted in many areas. Reports indicate that there has been a decreasing trend in the Malaria incidence in recent years [4, 6]. The prevalence rate of Malaria was reported about 1 in 10000 population at first midyear of 2002 and most of the cases were reported in summer [7]. Today, the south eastern area including provinces of Sistan-Bluchistan, Hormozgan province and south of Kerman are still considered as malarial endemic regions of Iran [8].

The forementioned provinces contains 6% of the population, but generates 79% of the total malaria cases in the country. Important is that there is considerable importation of malaria to this region from Afghanistan and Pakistan and this has been one of the reasons for the spread of chloroquine resistant *P. falciparum* [9].

The province of Yazd is located at the center of Iran and neighboring Kerman from the south. This area is not a malaria area, but since it is highly active in construction and industrial projects, it has become the host of many workers as refugees from malarial endemic areas of Iran and Afghanistan.

The aim of this study was to determine prevalence rates, age, sex and isolated species documented in Public Health Center of Yazd since 1985 to 2006.

### METHOD

The present descriptive study was conducted to indicate epidemiological feature of Malaria in the province of Yazd, Iran. Therefore, All episode from 1985 to 2006 documented in Yazd Central Health Service (CHS) was carefully studied and reported.

In general, all suspected Malarial patients are referred to central health service located in the city of Yazd by physicians working in different clinics or hospital. Then following collection of status information in questioner form by health service workers, the middle finger of

patient was scrubbed with 70% alcohol and stick it with a sterile lancet. Then one drop of blood was placed on a clean microscopic slide from one end and was spread with another slide to prepare an even smear. Following fixing with methanol and staining using Giemsa stain, the whole smear was precisely observed for any possible plasmodium species by an expert technician under light microscope [10].

Positive specimens together with patient's related information were recorded and sent to Health Center located at the center of province of Yazd. In time, the patient was referred to infectious diseases specialist for further treatment.

### RESULTS

A total of 4482 confirmed reported Malaria patients from 1985 to 2006 were investigated; 4257(95%) male and 225(5%) female (Fig 1). The mean average of patient's age was  $26.7 \pm 10.4$  for men and  $21.4 \pm 14.4$  for women ( $P=0.000$ ). As Figure 2 shows the highest rate of malarial disease

was seen at year 1991 with 846( 18.9%) cases and only 18 (0.4%) at 2004.

Note that the rate of malaria was declined since 1991 to 2004, but increased again at 2006.

Table 1 reveals that highest rate of disease occurred in summer season with 3574(79.7%) cases but 908 cases reported during the autumn and winter season.

Figure 3 indicates that 3817(85.2%) of isolated species were *P. vivax*, 614(13.7%) *P. falciparum*, 6(0.1%) *P.malaria* and the remainder 45(1%) was found to be mixed species. Figure 4 reveals the prevalence of disease in accordance to months. As this Fig. shows the highest rate was seen in June.

Prevalence of different malaria species according to year and season is presented in Tables 2 and 3 respectively. As Table 3 indicates, species of *P. falciparum* and mixed species were mostly isolated during the cold season (winter) but, however, *P. vivax* was the most prevalence species at hot season (summer).

Table 4 indicates the malaria cases according to the nationality of patients since 1985 to 2006.

Table 1: Prevalence of Malaria according to nationality

	Iranian No.(%)	Afghan No.(%)	Others No.(%)	Total No.(%)
Spring and Summer	772 (82.7)	2743(79.1)	59(71.1)	3574(79.7)
Autumn And winter	161(17.3)	723(20.9)	24 (28.9)	908 (20.3)
Total	993 (100)	3466 (100)	83 (100)	4482 (100)

Table 2: Reported rate of malarial spp. per year

	1985-1991 No. (%)	1992-1996 No.(%)	1997-2001 No.(%)	2002-2006 No.(%)	Total No.(%)
Vivax	1854 (85.4)	1227 (82.8)	585 (89.4)	151 (85.8)	3817 (85.2)
Falciparum	301 (13.9)	225 (15.2)	64 (9.8)	24 (13.6)	614 (13.7)
Malaria	6 (0.3)	0 (0)	0 (0)	0 (0)	6 (0.1)
Mix	9 (0.4)	30 (2)	5 (0.8)	1 (0.6)	45 (1)
Total	2170 (100)	1482(100)	654 (100)	176 (100)	4482(100)

Table 3: Prevalence rate of malarial species according to seasons

	Vivax No.(%)	Falciparum No.(%)	Malaria No.(%)	Mix No.(%)	Total No.(%)
Apr-Nov	3072 (86)	467(13.1)	5(0.1)	30(0.8)	3547(100)
Dec-Mar	745(82)	147(16.2)	1 (0.1)	15(1.7)	908(100)
Total	3817 (85.2)	614 (13.7)	6 (0.1)	45 (1)	4482(100)

Table 4: Trend of reported Malaria cases according to nationality during the past 21 years(1985-2006)

	1985-1991 No. (%)	1992-1996 No.(%)	1997-2001 No.(%)	2002-2006 No.(%)	Total No.(%)
Iranian	559 (25.8)	276 (18.6)	59 (9)	39 (22.2)	933 (20.8)
Afghan	1566 (72.2)	1174 (79.2)	590 (90.2)	136(77.3)	3466 (77.3)
Others	45 (2.1)	32(2.2)	5(0.8)	1(0.6)	83 (1.9)
Total	2170 (100)	1482(100)	654 (100)	176 (100)	4482(100)

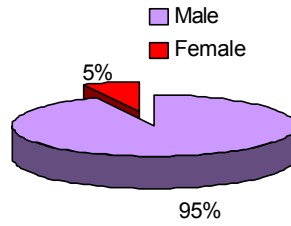


Fig. 1: The rate of Malaria according to sex

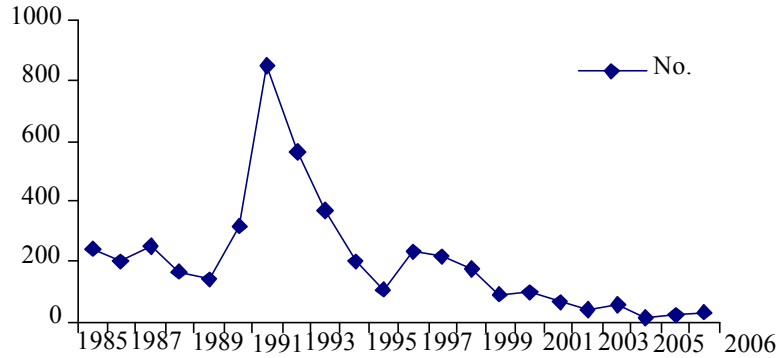


Fig. 2: Rate of Malarial patients referred to health service Dept. of Yazd since 1985-2006

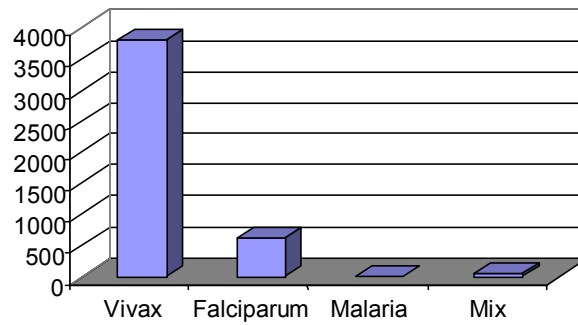


Fig. 3: Prevalence rate of Malaria species documented since 1985-2006

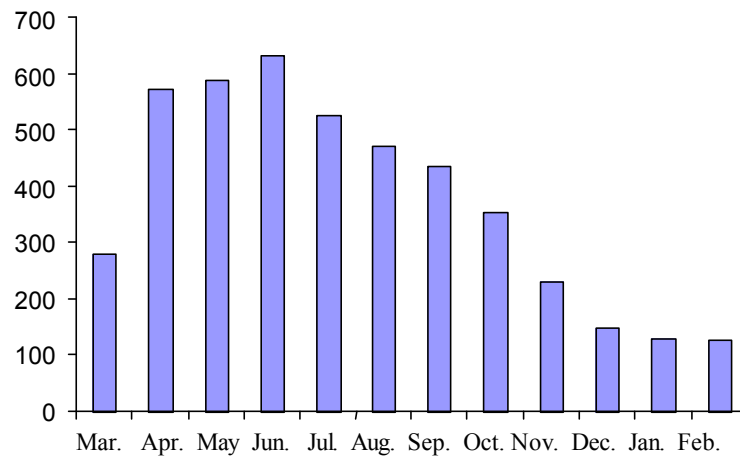


Fig. 4: Monthly prevalence of Malaria among patients referred to Yazd of Central Health Service

## DISCUSSION

Malaria was widespread in Iran in the past but nowadays is interrupted in many area including the province of Yazd [4, 8].

Analyzing the data collected for the present survey indicates that the total case numbers of malaria was 4482 since 1985 to 2006. According to data collected, the majority of patients were male (95%), but (5%) were female (Fig. 1).

In general, transmission of malaria is limited in Yazd but since the province is highly active in industry and construction projects, it has become the host of thousands of male refugees from the endemic malarial areas of Afghanistan and south-eastern of Iran [9].

The province of Yazd is located exactly at the center of Iran, closed to two endemic provinces of Kerman and Sistan-Blochistan; where generate 79% of total malaria cases in Iran [2, 4, 9]. Therefore malaria incidence in this area is imported and is due to the presence of workers come to Yazd for work mostly as construction workers.

Data collected in this survey show that the rate of malaria was steadily declined since 1999 to 2004, but increased significantly to 2006. The results concur with Behrens who reported that the total malarial disease in Iran by the year 1991 with 98160 cases was significantly dropt down to 22640 in 1999 [4]. This view is probably due to anti-malarial campaign set up by Iranian government together with obstruction of immigration of Afghan workers.

As table 1 shows, during late spring and summer (hot season), the rate of malaria was 3574(79.7%) cases. This report is similar to others survey performed in Iran and is certainly due to more construction project during the summer time [2,4,9].

As table 3 shows the majority of isolated species were *P. vivax* (85.2%) followed by *P. falciparum* with 13.7%.

The result obtained from this study is similar with other endemic regions including Iran. A survey conducted by Karimi *et al.* [1] evealed that prevalence rate of malaria in South east of Iran was 96 in 1000 persons. Mean age of patients was 22.5 years and most patients were seen and recorded in summer. 61% of patients were infected by *P. Vivax* and 20.7% *P. falciparum*, hence 18.3% mix infection (PV+PF).

Although, the most patients conducted malaria in our province were male, sex differences in the endemic area of south-east of Iran was not found significantly different.

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* [9].

Although many places in Iran reported that *P. vivax* is the most prevalent species, reports from some cities of Sistan va Bluchistan at the border of Pakistan shows the highest incidence of *P.falciparum* rate compared to other endemic regions in Iran [9]. When the cases were followed up, it was found that 50% of the cases diagnosed were from Pakistan [9]. Reports indicate that in addition to Sistan va Bluchestan, the province of Kerman and Hormozgan accounted 25% of *P.falciparum* which was imported from Afghanistan and Pakistan too. Therefore, our results confirms that cases of *P. falciparum* are mainly imported from internal region [9, 12, 13].

## CONCLUSION

Although malaria is one of the major public health problem in Iran, with more than 32616 cases in 1998 [9]. The malaria endemic areas of Iran located in the South-eastern part of the country.

These areas incorporated less than 5% of Iran's total population, but contain more than 85% of the total incidence of malaria cases in the whole country with *P. vivax* and *P. falciparum* are both present.

As mentioned before, the industrial province of Yazd is the host of construction refugee workers from both Afghanistan and Sistan-Bluchestan therefore, the majority of cases reported in our Health Central Service are from the fore mentioned areas and keeping the guest under control is difficult and sometimes impossible [9].

Since different reports revealed increasing resistance of malarial species against anti-malarial drugs therefore the best suggestion could be that providing free and enough health facility for suspected patients to come to health service for treatment [14,15]. In addition this is the task of health service workers to trace up the patients until complete treatment achieved.

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