

## Malaria Epidemiology in Sistan and Balouchestan Province during April 2008-March 2011, Iran

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Article information	Abstract
Article history: Received: 29 Sep 2012 Accepted: 20 Nov 2012 Available online: 10 Jan 2013 ZJRMS 2014; 16(4): 41-43	<b>Background:</b> Sistan and Balouchestan province is one of areas in Iran that have the highest malaria incidence. We have tried to investigate the epidemiology of malaria in this province. <b>Materials and Methods:</b> In this study, we evaluated epidemiological data of all malaria cases from April 2008 to March 2011 in this province. <b>Results:</b> In our study <i>Plasmodium vivax</i> was the most type of malaria. Malaria incidence was more in men and rural than female and urban. 22.7% of all cases were foreigners. Malaria incidence has had two picks. <b>Conclusion:</b> Malaria control interventions should be focused on high risk group and based on incidence peak.
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### Introduction

Currently, malaria is still one of the most important health problems in the world [1]. More than two thirds of malaria cases occur in the world's poorest population (one fifth of world population) [2, 3]. No other diseases as malaria have been cause irreversible financial and life loss in Iran yet. Most malaria cases in Iran have occurred in the Sistan and Balouchestan, Hormozgan, Kerman and Fars provinces. Malaria has always been a health priority in these areas [4]. According WHO Classification, Iran is among the countries with low burden of malaria and successful control programs, but local transmission of malaria in some area of these countries are reported [5]. WHO policies for Iran, is the elimination of malaria. Interventions should be focused on local transmission foci of disease and on case to case instead of a large population.

Unfortunately, neighboring countries such as Afghanistan, Pakistan, Iraq and some former Soviet republics, has made more difficult to control malaria in Iran [6]. Despite the declining trend of reported cases over recent years, the expansion of local transmission, especially in areas affected by border travelling is very worrying [7]. In this study, we have tried to investigate the epidemiology of malaria in this province. The results of the regional pattern of disease can use in malaria elimination programs.

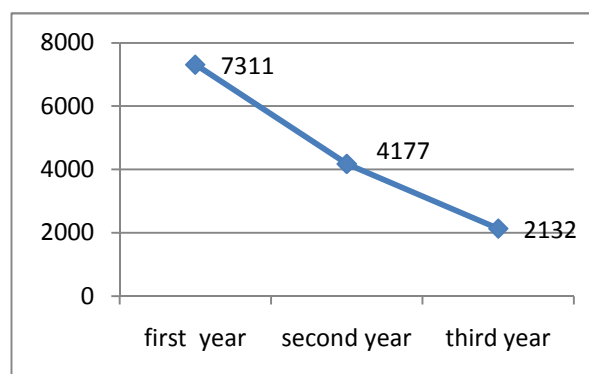
### Materials and Methods

In this cross sectional study, we evaluated epidemiological data of all malaria cases from April 2008 to March 2011 in Sistan and Balouchestan province. Data extracted from epidemiological data sheets which reported to diseases control department in Zahedan Health

center. Most results were expressed as a description and for analysis, we used  $\chi^2$  test.

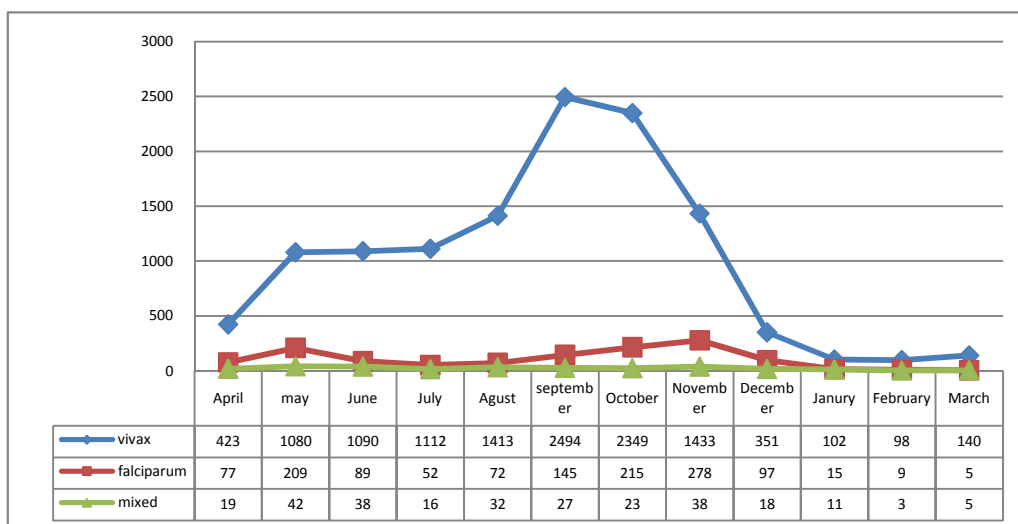
### Results

The total reported malaria cases during our study were 13620, number of cases in each year is shown in figure 1. Of the total malaria cases during these years; 88.6% were caused by *P. vivax* (12,064 cases), 9 % were caused by *P. falciparum* (1,236 cases) and 2.4% of them were mixed type (320 cases). Most of the cases were reported respectively from Chabahar (31%), Sarbaz (24.3), Nikshahr (10.2%) and Fanuj (10%).



**Figure 1.** Reported malaria cases in Sistan and Baluchestan province during April 2008 to March 2011

Among all malaria cases; 65.2% (8,880 cases) were male and 34.8% (4740 cases) were female. Among females 4.2% (199 women) have been pregnant. The age of patients ranged from one to 92 years and mod age was 18.



**Figure 2.** Number of malaria cases per month during April 2008 to March 2011

Based on our results; 79.9% (10,882 cases) of patients were rural and 20.1% (2,738 cases) were urban. In terms of nationalities, 77.3% of patients were Iranian, 14.1% were Pakistani and 8.6% of them were Afghan. Based on  $\chi^2$  test it was found falciparum incidence ratio in Pakistanis and Afghans is significantly higher than Iranians ( $p < 0.05$ ). In our study it was found that malaria (both *P. vivax* and *P. falciparum*), have had two peaks. *P. vivax* peak was related to June and September and *P. falciparum* peak was related to May and October (Fig. 2). The highest incidence of malaria has occurred in the first three decades of life

## Discussion

Based on our results, it is clear Malaria incidence during the three year study, has declined that reflect the relative success of malaria control programs in order to achieve the goal of eliminating malaria in the province.

At all 11460 malaria cases have been reported from Iran to WHO In 2008. Only 9.7% of them were *P. falciparum*. 90% of all Iran malaria cases were reported in the Sistan and Balouchestan, Hormozgan and Kerman provinces and malaria incidence peak related to September, October and November [4]. In our study, 88.6% of malaria cases were *P. vivax* and 9% of them were *P. falciparum* and 2.4% were mixed type that is compatible with the above report.

Darabi et al. conducted a study, in Bushehr in 2005 and found, most cases (36%) occurred in 20-29 age group, 97% of cases, were men and 3% were female, 66% of them were Iranian and 44% were foreigners 99% of cases were *P. vivax* and 1% were *P. falciparum* [8].

Sobhani and colleagues study was conducted during 1383-1367 in Dezful. They found among 1353 of malaria cases, with regard to job, men workers have had the most percent of malaria (98%), and 40.5% of them were foreigners (Afghan) [9]. Arshi et al. in a study in Dasht-e-Moghan during 1999-2000 showed that most cases were reported in August, September and October. There was no significant difference in prevalence between female and

male, and all cases were *Plasmodium vivax* [10]. Study of malaria epidemiology in Ardabil province in 1999-2000 by Arshi and his colleagues showed that all 509 diagnosed cases were vivax and all of them were reported in the first 7 months of the year [11]. Zia Sheikholeslami and colleagues in a study in Rafsanjan and Kerman in 2005-2008 concluded most patients were men (92.3%) and most of them were workers (85.7%). Also 98.9% of them were Afghan and most cases (46.2%) found in 20-29 years of age [12]. Baseri and et al. studied malaria in Iranshahr during 2005-2006 and concluded the result of higher malaria incidence in Afghans than Iranians may be due to their life style rather than border travelling. They also found that Afghans less referred to health care centers then it also will be important in their treatment [13].

Karimi-Zarchi et al. studied malaria epidemiology in Khorasan province in 2004 and found the highest malaria incidence was related to age group 10-14 years and the incidence peak have occurred in July and August [14].

Epidemiologic study of malaria in the Hormozgan province during 1995-1998 showed that among 38,082 malaria cases in 5 years; 90.49% of them were *Plasmodium vivax*, 9.39% were *Plasmodium falciparum* and 0.12% was mixed type [15].

As the results showed malaria in Sistan and Balouchestan province has been limited to species of vivax and falciparum. The number of falciparum malaria cases was 1236 during three years, of whom 545 were foreign immigrants. The falciparum incidence ratio in foreign immigrants was more than like ratio in Iranians that reflects that the major part of falciparum malaria in province, was importing. The highest malaria cases reported from Chabahar, Sarbaz and Nikshahr cities. It can be related to favorable environmental conditions, including long the hot season and stagnant waters, beside it is related to the quality of malaria surveillance system in cities and travelling on the eastern border. Almost two-thirds of the patients were male, which is compatible with the results of other studies. This result can be related to

the habits of men to sleep outdoors and more exposure to *Anopheles mosquito*.

Most patients were rural. In our study, most cases were reported in the first three decades of life, especially in the age group 10-19 years. Relatively high incidence of malaria in the age group below 10 years (22%) is not compatible with some of the above studies. Considering, the disease is endemic in the region and relative immunity in adults, more incidence in the first three decades of life include the age group below 10 years can be expected. Malaria in this province had two incidence peaks. The first peak has occurred in May and June and the second peak in September and October. That was not matches with the results of other epidemiological studies and the general pattern reported in Iran.

According to the ultimate goal of malaria elimination program up to 2025 that is the interruption of local transmission of malaria, improve malaria control interventions, including programs to border travelling control, focused interventions on high-risk groups such as rural men aged under 30 years, in high incidence areas,

and interventions according to the environmental life cycle stages of the mosquito *Anopheles*, and the peak incidence time in the province can be an effective step in achieving the elimination of malaria in the province.

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### Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

### Conflict of interest

The authors declare no conflict of interest.

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### References

1. The World Malaria Report (2010); XI available at: [http://www.who.int/malaria/world\\_malaria\\_report\\_2010/worldmalariareport2010.pdf](http://www.who.int/malaria/world_malaria_report_2010/worldmalariareport2010.pdf)
2. Guerin PJ, Olliaro P, Nosten F, et al. Malaria: current status of control, diagnosis, treatment and a proposed agenda for research and development. *Lancet Infect Dis* 2002; 2(9): 564-73.
3. Stratton L, O'Neill MS, Kruk ME and Bell ML. The persistent problem of malaria: Addressing the fundamental causes of a global killer. *Soc Sci Med* 2008; 67(5): 854-862
4. Malaria Elimination Program in Iran up to 2025. Iran Ministry of Health and Medical Education. Available at: <http://siasat.behdasht.gov.ir>
5. Ahmed-Salah M. Malaria control and elimination in the WHO Eastern Mediterranean Region 2006–2010. The regional malaria strategy 2006 –2010:11-14. available at: <http://www.emro.who.int/rbm>
6. Chen LH, Wilson ME, Schlagenhauf P. Prevention of malaria in long-term travelers. *JAMA* 2006; 296(18): 2234-44.
7. Raeisi A, Nikpur F, Ranjbar M, Faraji L. [Malaria Trend in Islamic republic of Iran during 2002-2007] Persian. *Hakim Res J* 2009; 12(1): 35-41.
8. Darabi H, Raeisi A, Zare SH, et al. [Evaluation of malaria epidemiology in Bushehr 2005] Persian. *J Kerman Univ Med Sci* 2006; 13:76.
9. Sobhani R, Safarizadeh F, Alavi P. [Epidemiological study on Malaria Indicators in Dezful city during 1978-2004] Persian. *J Kerman Univ Med Sci* 2006; 13: 105.
10. Arshi SH, Abasgholizadeh N, Javanruzegar A. [Evaluation of malaria prevalence in Dasht-e-Moghan during 1999-2000] Persian. Available at: <http://lib.arums.ac.ir/>
11. Arshi SH, Sadeghi H, Mohebbali M and Sezavar S. [Malaria Epidemiology in Ardebil Province during 1999-2000] Persian. *J Ardebil Univ Med Sci* 2002; 2(5): 28-33.
12. Zia-Shaikhholeslami N, Rezaian M. [Retrospective evaluation of malaria epidemiology in Rafsanjan city during 1999-2005] Persian. *Ardebil J Health* 2010; 1(1): 24-30.
13. Baseri H, Holakui-Naieni K, Raiese A, et al. Comparison of knowledge attitude and practice about malaria prevention between Iranians and Afghans in Iranshar city during 2005-2006] Persian. *Iranian J Epidemiol* 2007; 3(3-4): 7-13.
14. Karimi-Zarchi A, Mahmudzadeh A, Vatani H and Shirbazu SH. [Epidemiological Evaluation of malaria and vectors in Sarakhs boundary villages] Persian. *Iranian J Infect Trop Dis* 2004; 8(20): 47-50.
15. Solaimani-Ahmadi M, Shahi M, Usofi H. [Malaria in Hormozgan province during 1995-1999] Persian. *Hormozgan Med J* 2001; 5(2): 5-9.

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