Malaria in Bushehr Province (2001-2008), Southern Iran: An Approach Towards Elimination

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Every year about 300-500 million individuals catch malaria throughout the world and 2-3 million of them who are mostly children and pregnant women die. Most malaria cases in Iran are reporting from Sistan and Baluchistan, Kerman and Hormozgan provinces, but there is still the risk of roll back malaria and it's again incidence in eradicated areas, so it is still possible to incidence of epidemics in endemic area. Eradication of disease and prevention are one of the main policies of Department of Health of I.R.Iran. This research is conducted to determine the epidemiological aspects of this disease in Bushehr province, southern Iran. This Retrospective study is conducted based on statistical data collected from different Health Centers of Bushehr province from 2001-2008. A questionnaire including different variables such as age, sex, year, nationality, type of the parasite and township were designed. Data were analyzed using SPSS software program. The total number of 1470 cases of disease is registered within eight years. Most of the cases belonged to Bushehr and Kangan cities, due to *Plasmodium vivax* parasite. Local transmission was recorded in 11% of the cases and 98% of local transmission have been occurred in Kangan city. Elimination of Malaria is based on effective and successful operation specially developing intervention with controlling the vectors and medical care and treatment of new identified cases of disease. Considering that patients have foreign nationality who enters the province as workers, so having accurate and cohort program to identify the fire places, quick identification of cases, public training, review and accurate classification of disease cases with special treated measures of tactical program in national level can help the elimination of the Malaria.

Key Words: Malaria Elimination, Bushehr, Iran.

Human malaria causes by five species of parasites of the genus *Plasmodium* including *P. falciparum*, *P. vivax*, *P. ovale*, *P. malariae* and *P. knowlesi*. Malaria due to *P. falciparum* is the most dangerous that could lead to dead, and it predominates in Africa. *Plasmodium vivax* is less dangerous but more widespread, and the other species are found much less frequently. Malaria is transmitted to humans by the bite of infected female

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mosquitoes of more than 30 anopheline species. An estimated 3.3 billion people were at risk of malaria in 2010, although of all geographical regions, populations living in sub-Sahara Africa have the highest risk of acquiring malaria; in 2010, 81% of cases and 91% of deaths are estimated to have occurred in the WHO Africa Region, with children under five years of age and pregnant women being most severely affected.

Malaria endemicity varies enormously across the Eastern Mediterranean Region; some countries are already free of malaria, a few have made substantial progress in control over the past decade, and some have a persistently high disease burden. These countries are in various stages of malaria control, seven still have areas of high malaria transmission and are in the control stage (Afghanistan, Djibouti, Pakistan, Somalia, Sudan, South Sudan, and Yemen) two countries with geographically limited transmission are in the elimination stage (the Islamic Republic of Iran, and Saudi Arabia). Egypt, Oman and the Syrian Arab Republic are in the prevention of reintroduction stage. The remaining countries are malaria-free (World malaria report, 2010). In Iran, malaria is one of the most important diseases, which has created economic and social damages until now. In the last decades, expand and powerful strategy plans, have eradicated malaria in some provinces of Iran, and have reduced its incidence in other endemic provinces. By successful prophylaxes and control programs in the last 50 years, in expand areas of Iran, it has not be seen malaria transmission, and just in some district areas in south-east of Iran, it has be seen some local transmissions of malaria. Although malaria cases have been reduced in 50 years ago from 5 million cases to 16467 cases in 2007, and although more than 91% of malaria cases in Iran is reported from Sistan and Baluchistan, Kerman and Hormozgan provinces, Sistan and Baluchistan has the first level, but there is still the risk of roll back malaria and it's again incidence in eradicated areas, and so it is still possible to incidence of expand epidemics in endemic areas (Raeisi *et al*., 2009). Bushehr province due to its climatic conditions, and presence of some important active vectors, and its neighborhood to Hormozgan, Khuzestan and Fars provinces, and its relationships with infected areas such as Kerman and Sistan and Baluchistan provinces, has been exposed to expand epidemic malaria. These problems always threat this province.

Table 1. Epidemiological survey of malaria cases in Bushehr Province, Southern Iran, 2001-08

Total Number	Transmission type						Year
	Un-known	Relapse	Imported	From imported	Introduced		
266	6	12	229	19	0	No.%	2001
	2	5	86	7	0		
323	16	13	225	4	65	No.	2002
	5	4	70	1	20		
163	6	9	144	2	2	%	2003
	4	6	88	1	1		
162	2	33	111	14	2	No.	2004
	1	20	69	9	1		
244	5	29	92	25	93	%	2005
	2	12	38	10	38		
71	1	16	43	11	0	No.	2006
	1	23	61	15	0		
96	5	14	74	2	1	%	2007
	5	15	77	2	1		
145	5	17	119	4	0	No.	2008
	3	12	82	3	0		

MATERIALS AND METHODS

This retrospective study is conducted based on statistical data collected from different Health Centers of province from 2001-2009. Blood samples are obtained from all suspected cases then they are transferred to the laboratory. The blood slides were investigated by microscopists, and double checked by experts in provincial referral laboratory. The data were transferred to the designed tables according to desired variables such as age, sex, year, nationality, type of the parasite and township. Data were analyzed using SPSS software program. Excel software was used for preparing charts.

RESULTS

A total number of 1470 cases of disease were registered within eight years (Fig. 1, Table 1). Most of the cases belonged to Bushehr and Kangan Districts. Eighty five percent (1248 cases) of patients were due to *Plasmodium vivax* and 10% (153 cases) of them were positive with *Plasmodium falciparum* (Fig. 2). Sixty one percent (897) of the cases were identified through passive activity and 39% (573) through active activities. According to figure 3, about 87% (1279) of patients had foreign nationality. Most of the cases occurred in 2002 (323 cases) and least of them on 2006 (71 cases). Eleven percentages of the cases were

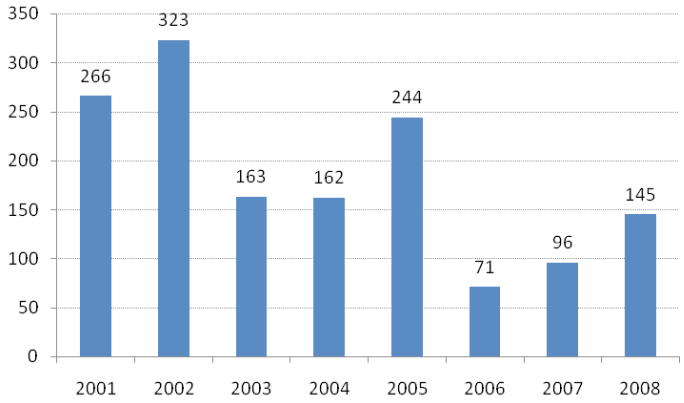

Fig. 1. Trend of malaria in Bushehr Province, Southern Iran, 2001-2008

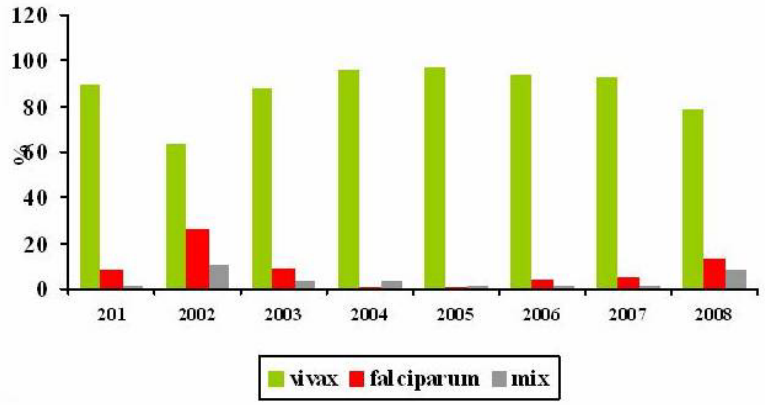

Fig. 2. Cases of malaria based on *Plasmodium* species in Bushehr Province, Southern Iran, 2001-2008

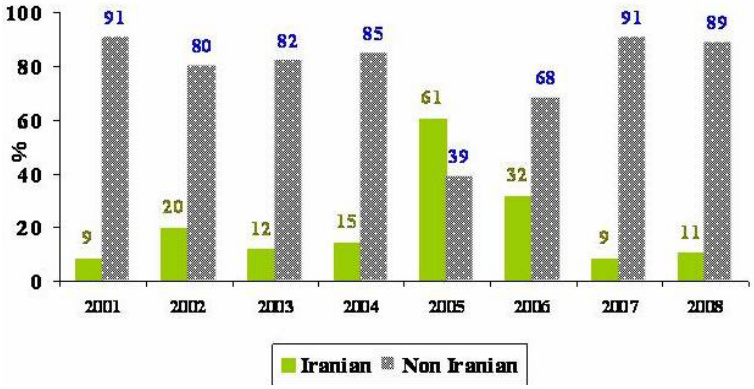

Fig. 3. Cases of Malaria based on nationality in Bushehr Province, Southern Iran, 2001-2008

occurred through local transmission and 70% through those who were entered the province. Most of cases that occurred through local transmission (98%) were reported from Kangan district.

DISCUSSION

The positive cases of malaria are recording based on the parasite species. During the study period, the highest portion of malaria cases was reported due to *P. vivax* with a range of 63% and 97% in 2002 and 2005, respectively. During these years the cases of *P. falciparum* was ranged from 1% in 2004 and 2005 to 26% in 2002. From the positive cases, 57% of *P. vivax* cases and 68% of *P. falciparum* cases were detected in Kangan city. There are reports of malaria detection in different part of the country, but most of them are imported cases. According to the surveys that had been carried out from 1986 to 1996 in Isfahan province, central Iran, 9720 malaria cases were studied, 91.5% of them were from Afghan immigrants. Also 96.2% of patients were men and 3.7 % of them were women (Ataei *et al*., 2000). In Mazandaran province, north of the country, from 1999 to 2003, 518 positive cases were reported, that 85.3% of them were from Afghan refugees and infected passengers, and only 13.7 % of them were transmitted locality (Najafi *et al*., 2006). According to the surveys that had been carried out from 1996 to 2003, in Kohgilluyeh and Buyer Ahmad province, 485 malaria cases had been reported, that 63% of them were Iranian, and 38% of them were Afghan refugees. 94.4% patients had infection with *P.vivax,* and 5.2% patients had infection with *P. falciparum* (Moshfe' *et al*., 2003). In Hamedan province from 1980 to 2000, among 506 reported malaria cases; 62% of them have been internal transmission in Iran, and 13.4% of them have been external transmission from neighborhood countries, and 2.96% of them were local transmission (Falah *et al*., 2003). There are more reports in this case from the country. During 2001 only 9% of patients were Iranian and 81% of them were foreign immigrants, while during 2005 and 2007 the most cases were Iranian. This change has been occurred following the increasing of the malaria cases and the epidemics that was happened with huge immigration of workers from endemic part of southeast of Iran to the study area. Because the area is an economic zone for gas production, most of inhabitants are male workers and employees of the gas project, so that 88-99% of positive cases were males. As it is mentioned above, endemic areas for malaria are mainly in southeast of Iran, although the transmission potential exists in southern parts of the country as well as northwest. In East Azerbaijan province, northwest of Iran, during 1982-1991 from 444 malaria cases, 184 local transmission cases had been reported (Naghili, 1993). In the study that carried out in Ardabil province from 1999 until 2000, 509 malaria patients had been reported. All of them had local transmission (Arshi *et al*., 2000). Local

transmission is reported between 0 to 38% during 2001-2008, mostly happened in Kangan city. During 2002 and 2005 an epidemic was occurred due to entrance of the gas project workers to the area with potential of malaria transmission. Some of them were carriers from the endemic areas for malaria and others were from non-endemic areas with low immunity to malaria. Therefore the epidemic was occurred. According to the surveys that was carried out in 1985 and 1986 in Brazil and Amazon region of Latin America about human migration and the spread of malaria, it has been shown that some human migration into Amazon region from the other parts of Brazil, make a steady increasing in malaria cases in Amazon region. Due to the documentary records in 1986, the rate of *P. falciparum*, *P. vivax* and *P. malariae* infections in Brazil was 5325, 8336 and 3 respectively. But in Amazon which had a large migration from the other parts of Brazil, the number of *P. falciparum*, *P. vivax* and *P. malariae* infections was 230079, 188381 and 1 respectively. So the great increase of migration into the Amazon region and population shifts and within that region has led to a considerable rise in the transmission of malaria (Cruz, 1987). Elimination of Malaria is based on effective and successful operation specially developing intervention with controlling the vectors and medical care and treatment of new identified cases of disease. Considering the fact that patient were foreigners who entered the province as workers, therefore having accurate and cohort program to identify the fire places, quick identification of cases, public training, review and accurate classification of cases of disease with special treated measures of tactical program in national level can help elimination of the Malaria.

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