

Epidemiology study of malaria in Larestan during 2001-2011

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Original Article

Abstract

Introduction: Malaria is one of the most prevalent parasitic diseases in tropical and subtropical regions of the world. In all provinces of Iran except Sistan and Baluchestan, Hormozgan and the tropical parts of Kerman, malaria is under control. However, due to favorable conditions, the possibility of incidence in parts of the country still exists. So Disease surveillance and epidemiological study is necessary to control the disease. The aim of this study was to investigate malaria in Larestan during 2001-2011.

Methods: This study was a cross-sectional-descriptive study. Use of patient records was conducted during 2001-2011 at the Larestan Center for Disease. Demographic and clinical characteristics of patients extract from the recorded documents and descriptive statistics (frequency and percentage frequency) and surveillance indicators ABER, SPR, API were calculated. For data analysis and calculation of indicators SPSS 16 and Excel 2007 software were used.

Results: 623 cases were recorded. 87.5% was men, and 6.9% was Iranian. 89.4% suffering vivax, 7.4% falciparum and 3.2% was mixed. In addition, from an epidemiological point of view 52.5% were introduced cases, 45.9% were relapse cases, 1.6% were Indigenous cases, and none of them from local communication. 2 deaths were reported in 2001 and 2002. ABER index was 4.1 in 2009 compare to 1.8 in 2005. SPR index was 2.7 in 2001 compare to 0.05 for 2010, and API index was 95 per thousand in 2002 compare to 1.28 in 2011. SPR and API indices have regular decreasing.

Conclusion: Results showed a regular decreasing trend in the incidence of malaria in Larestan. If this trend and surveillance continue in the future, malaria will not be a health problem for Larestan in future.

Key words: Epidemiology, Malaria, Vivax, Falciparum

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Introduction:

Malaria is currently one of the major health problems in many parts of the world, particularly in

sub-Saharan Africa. Malaria is endemic in 106 countries and caused a lot of deaths as well as anemia, inability to work and the subsequent

negative effects on society, the economy and agriculture in involving countries (1). Despite, the design and implementation of RBM (Roll Back Malaria) to reduce malaria and its consequences until 2010, It seems that other than Europe and North America, the rest of the world are engaged in the social economic burden of malaria (2,3).

According to the latest World Health Organization estimates 219 million cases of malaria (approximately between 154 million to 289 million cases) and 660,000 deaths (roughly between 610 000 to 971 000 cases) have occurred in 2010. From 2000 to date, the deaths from malaria have fallen by 25 percent worldwide. In addition, this reduction was 33 percent in parts of Africa. Most deaths occur among African children, so that every minute a person loses his life due to malaria. It is estimated that 80% of deaths from malaria occur in 14 countries, 80% of the disease cases occur in 17 countries, and about 40% of deaths from malaria occur in two countries of the Democratic Republic of Congo and Nigeria (4). About 60 percent of people in the countries of the Eastern Mediterranean region are at risk of malaria, and Iran is among them and is a part of areas with relatively low endemicity. Yet no other diseases like malaria have caused mortality and economic problems (5-7). In Iran, due to favorable climatic conditions in South and South East of the country and neighboring with Pakistan, Afghanistan and Iraq countries, malaria is still considered as an important health problem for the country. In 2011, nearly 2,700 cases of malaria were reported that opposed to 16,000 cases in 2006 have shown significant decrease (9). Now, removing the Local falciparum transmission, preventing the reappearance of falciparum and reducing cases of falciparum to less than 895 by 2016, is the malaria care target in Iran. For this reason, children under 5 years, pregnant women, those who live in remote areas without electricity (more than 50 km distance to health centers) and residents of the border areas as well as foreign nationals are the focus of public health authorities (9). Several studies have been conducted on the epidemiology of malaria in Iran that their common point was reduced malaria cases in the past decade and they were in all dominant studies of Afghan refugees' patients and were male. (6-8, 10-12).

Larestan with a population of 226 thousand people in 2011 is the most southern city of Fars and northern neighbor of Hormozgan province that with warm and wet climate, it was a good habitat for the development of malaria for many years, so that during the past decades, it was allocated the most malaria cases in Fars province. However, in recent years the incident of disease has been declining. Larestan neighboring with Hormozgan province and having suitable ecological conditions in order to complete the cycle of disease, Lar city is considered as one of the areas receiving the disease. On the other hand, the hosting many Afghan refugees are provided proper parasitic reserves to local transmission of diseases. Therefore, this study aimed to evaluate epidemiologic, malaria process in Larestan during the years of 2001-2011 to help plan favorable caring, and controlling of diseases in the city.

Methods:

The study was conducted in a cross-sectional way. The study population was all malaria patients detected from the years 2001-2011 in the city of Larestan. Therefore, data on 627 patients registered at the center of fighting against disease in the city of Larestan were extracted from Epidemiology study forms. It should be noted that malaria has been an acceptable surveillance system for a long time ago and for this reason, the forms were all completed accurately. Extracted data from the forms included demographic information such as age, sex, nationality and as well as information about the type of surveillance (active/passive), Parasite (falciparum, vivax, Mix), epidemiological classification (incoming, flares, transfer of incoming, local and return transfer) and the number of taken peripheral blood slides, respectively.

ABER, SPR and API indexes are calculated for all years. ABER index shows the prepared amount of slide in order to detect malaria cases per hundred of the population over a one year period. SPR index represents the percentage of positive slides to all the examined slides and API or Annual Parasite Incidence of malaria indicates the incidence of malaria per hundred thousand people during one year. All calculations were performed by using

SPSS 16 software and Microsoft Office Excel 2007.

Results:

From 2001 to 2011, the number of 623 cases of malaria was recorded in the city of Larestan. Of this number, 545 people (87.5%) were male and 78 people (12.5%) were female. One case of female patients was pregnant in 2004. 43 cases (6.9%) were Iranian and the remaining were non-Iranian, including five Pakistani and 575 Afghans. Two cases of these patients had died between 2001 and 2002, both Afghan and male patients that were diagnosed with falciparum malaria. Table 1 shows the prevalence of the disease based on gender, nationality and age groups.

Table 2 shows the Surveillance condition and malaria care indexes. As can be seen, 79.05 % of peripheral blood slides, which has been taken, were active and 94.20 percent were passive. The rate of peripheral blood slide positivity in passive slides was 23.3 percent and an active slide was 13.0 percent. In 2005, the ABER index was 80.1 that were the lowest and in 2009, this index was 10.4 that were the highest during the years of 2001-2010. SPR index was varied in the range of 70.2 to

50.0 percent during the past 10 years and had a decreasing trend roughly from 2001 to 2010. The parasitic annual incidence was varied from 95% per hundred thousand a year in 2001 to 28.1% per hundred thousand in 2010, and this index shows a decreasing trend.

(89.4%) 557 patients had vivax parasite, (7.4%) 46 people had falciparum and (21.3%) 20 patients had vivax and falciparum at the same time, and the most cases (52.5%) were the classification of Epidemiology. Full profiles of patient cases were shown based on the type of parasite and epidemiology classified for different years in Table 3.

Epidemiology classification distribution was different in terms of nationality and gender. Cases of recurrence in Afghan patients were more than Iranian patients as well as the ratio of incoming materials in Iranian patients were more than Afghan patients were. Transfer of incoming materials in female patients were more than male patients, respectively (Table 4).

Table 1. The frequency of malaria based on gender, nationality and age groups

Age groups	Iranina				Non-Iranian				Total	
	Male		Female		Male		Female		Frequency	Percenta
	Frequency	Percenta	Frequency	Percenta	Frequency	Percenta	Frequency	Percenta		
Under 1 years old	0	0	0	0	2	0.4	1	1.4	3	0.5
1-4 years	2	5.4	0	0	14	2.8	14	19.4	30	4.8
5-9 years	1	2.7	0	0	17	3.3	19	26.4	37	5.9
10-19 years	8	21.6	4	66.7	93	18.3	15	20.8	120	19.3
20-29 years	12	32.4	1	16.7	209	41.1	8	11.1	230	36.9
30-39 years	5	13.5	1	16.7	106	20.9	7	9.7	119	19.1
40-49 years	6	16.2	0	0	44	8.7	7	9.7	57	9.1
50-59 years	3	8.1	0	0	18	3.5	1	1.4	22	3.5
More than 60 years	0	0	0	0	5	1.0	0	0	5	0.8
Total	37	100	6	100	508	100	72	100	623	100

Table 2. Prevalence of malaria parasite and care indicators over the period 2001-2011

Year	The population	The number of lams taken		The number of positive lams		Number of patients	Epidemiological indices		
		Active	Passive	Active	Passive		ABER in hundred people	SPR in hundred people	API in one hundred thousand people
2001	267196	7885	1360	45	204	249	3.46	2.69	93.19
2002	268750	6879	861	8	130	138	2.88	1.78	51.34
2003	266555	4442	1129	0	78	78	2.09	1.4	29.26
2004	270773	4842	1115	6	25	31	2.19	0.52	11.44
2005	261778	3659	1053	6	29	35	1.79	0.74	13.37
2006	240875	6562	1146	2	15	17	3.2	0.22	7.05
2007	249846	8418	1326	4	19	23	3.9	0.23	9.20
2008	237914	6612	1715	8	18	26	3.5	0.31	10.92
2009	237244	5309	4418	1	11	12	4.09	0.12	5.05
2010	233836	3488	1633	0	3	3	2.18	0.05	28.1
2011	197061	4896	937	3	8	11	2.9	0.18	5.58
Total		(79.05%) 62992	(20.94%) 16693	(0.13%) 83	(3.23%) 540	623			

Table 3. Prevalence of parasite type and epidemiological classification in the of malaria patients

	Type of parasite			Epidemiological classification			Total	
	Vivax	Falciparum	Mix	Incoming (%)	Recurrence (%)	Transfer from the incoming (%)		Local transmission (%)
2001	232	17	0	119 (8.47)	127 (51.0)	3 (2.1)	0	249
2002	123	14	1	63 (7.45)	68 (3.49)	7 (1.5)	0	138
2003	69	8	1	46 (0.59)	32 (0.41)	0	0	78
2004	29	1	1	13 (9.41)	18 (1.58)	0	0	31
2005	34	0	1	22 (9.62)	13 (1.37)	0	0	35
2006	13	2	1	13 (5.76)	4 (5.23)	0	0	17
2007	17	1	5	14 (9.60)	9 (39.1)	0	0	23
2008	18	3	5	18 (2.69)	8 (8.30)	0	0	26
2009	9	0	3	8 (7.66)	4 (3.33)	0	0	12
2010	3	0	0	1 (3.33)	2 (7.66)	0	0	3
2011	10	0	1	10 (9.90)	1 (1.9)	0	0	11
Total	557 (40.89)	46 (7.40)	20 (21.3)	327 (5.52)	286 (45.9)	10 (6.1)	0	623

Table 4. Study the epidemiological classification based on gender and nationality

Epidemiological Classification	Gender		Nationality	
	Male	Female	Iranian	Non-Iranian
Incoming	284 (52.1)	43 (55.1)	34 (79.1)	293 (50.5)
Recurrence	256 (47.0%)	30 (38.5%)	6 (14.0%)	280 (43.3%)
Transfer from the incoming	5 (0.9%)	5 (6.4%)	3 (7.0%)	7 (1.2%)
Local transmission	0	0	0	0
Total	545 (100%)	78 (100%)	43 (100%)	580 (100%)

Conclusion:

From 2001 to 2010, 623 cases of malaria were detected and treated in Larestan, except two men of Afghan refugees, who were suffering from the falciparum type and it led to death. In a study in Larestan by Furutani (13), 3.6 percent of Afghan immigrants, specially newly arrived without having symptoms, were infected with the malaria parasite that were a threat to the city.

Malaria had a downward trend from 2001 to 2010 in Larestan so that from 249 cases in 2001 has decreased to 3 cases in 2009 (Table 2).

More than half of the cases occurred between 2001 and 2002. This declining trend of malaria cases was seen in in the study of Rayisi et al in the country (10) and studies in Mazandaran (6), Qom (11), Sistan and Baluchestan (12) and Yazd (7).

These decreases are likely due to efficient care system in the country and the city, climate change and recent droughts as well as the less presence of Afghans in the city and perhaps somewhat to developments regarding the care and treatment of malaria in Afghanistan. Again a slight increase was seen in 2011 and 11 cases of the disease have been identified that all were foreign nationals (5 Pakistanis and 6 Afghans), and all have come to work in Larestan and have worked in Mehr building complex. It is explainable that the presence of Pakistani nationals in the city was unprecedented. From the Epidemiological point of view, 10 of these patients were incur and one case was a recurrence (Table 3) and no transfer has taken place in the city and the cases were identified and cured well by Larestan health center staff.

ABER index is the operations working index and is a surveillance quantity indicator, from 2001 to 2011, it had different fluctuations, this rate was the lowest in 2005 and in 2009 was the highest amount. The reason for this increase in 2005 is, the more attention to the importance of surveillance as passive and managing changes in the fighting the disease unit of the city (Table 2). 79.05 percent of the slides were prepared active and 5.20 percent were prepared passive. However, the rate of passive slides positivity was 23.3 and active slide was 13.0 (Table 2) that is an indication of the passive surveillance effectiveness. The importance of active surveillance is also in place. SPR index that indicates the amount of positive slides to the

total slides had a decreasing trend from 7.2 percent in 2001 to 0.05 percent in 2010 aligned with the number of patients. In other studies, it has also been the same (6,8,11,14).

The annual incidence of parasitic index or the same API has a similar decreasing trend with the SPR and it varied from 95 cases per hundred thousand people in 2001 to 28.1 per hundred thousand people in 2010 and in 2011 reached to 57.5% per hundred thousand people. All of which reflects the reduction in the incidence of disease in the population that is in accordance with the country and other regions of the country trend (6,7,11,14).

Reduce the incidence of parasitic disease at the same time, and the positive slide index to the prepared slide, along with a surveillance increase (prepared slide to the Covered Population), indicates the improvement of disease care and reducing the likelihood of the unidentified patients in the period of 10 years under study.

As seen in Table 3, most of the disease cases in terms of parasite type were vivax throughout the years, that is a dominant parasite in the country and it was the same in other studies that had been done in recent years in the country (6,8,10,12).

From the Epidemiology classification point of view, most cases were incoming (5.52 percent) from Kerman, Hormozgan as well as Afghanistan and Pakistan had entered into the city. 4.45 percent were the recurrences that were caused by inadequate treatment of patients in the country of Afghanistan. It should be noted that about 280 Afghan patients were encountered with recurrences of the disease while only 6 cases were Iranian (Table 4).

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