

# A Survey of Community Knowledge and Practices on Malaria Control with Indoor Residual Spraying in Kazerun, South Iran

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## Abstract

**Background:** The main aim of this research is to investigate the knowledge, attitude and practice (KAP) on malaria control with respect to indoor residual spraying (IRS) in a community of Southern Iran. Human malaria is an important vector-borne infectious disease in Iran. It remains endemic over most parts of the oriental region of Iran that is still in the pre-elimination phase without considerable drop in the proportion of malaria cases.

**Methods:** This research was a cross-sectional household survey conducted in Kazerun, Fars province, Iran, to examine the malaria status and identify the parameters that obstruct the progress of the elimination phase. A standard questionnaire with 20 questions was provided to households including knowledge, attitude and practice categories. Sampling was then stratified to choose the samples in three rural foci of Kazerun.

**Results:** The sex ratio of participants included 192 females (92.3%) and 16 males (7.7%), respectively. This community benefited mostly from acceptable literacy level. A strong association prevailed between the majority of respondents' (88.5%) knowledge of fever and chills as the main symptoms of malaria and their literacy level. The majority (198, 95.2%) of volunteers declared that malaria disease was transmitted through the mosquito bites. In line with this study, literate persons have raised motivation and attitude to use bednets and keep themselves away from mosquitoes. These individuals cooperate perfectly with healthcare workers in malaria control program strategies (especially IRS).

**Conclusion:** Comprehensive and synergistic measures are needed to be taken to manage malaria elimination strategy in Iran.

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**Keywords:** Malaria, IRS, KAP, Insecticide, Iran

## Introduction

Human malaria is one of the most vital vector-borne diseases in the world. It is also considered as a main barrier to the progress of human societies.<sup>1</sup> Nowadays, approximately 3.3 billion people are at risk of malaria.<sup>2</sup> It caused 438,000 deaths in 2015, with most of these deaths

among children under the age of 5 years in Africa.<sup>3</sup> Indeed, malaria is one of the main parasitic diseases in Southern Iran.<sup>1</sup> The elimination program against malaria has intensively begun in Iran since 2010. Then, the burden of this infection declined during these efforts.<sup>4</sup>

Currently, it has been restricted to some parts of the southeast (Oriental) provinces of Iran. According

to national surveillance committee, a total of 799 malaria cases were reported in 2015, among whom 167 patients were recognized as indigenous cases and the number of imported ones was 632. About 90% of malaria transmission are seen in the endemic areas of southeast Iran each year.<sup>5</sup>

When implemented together, residual spraying and use of mosquito bed nets have synergistic effects. Swift diagnostic test and suitable treatment could be conducive to the next stages against malaria.<sup>6</sup> People's belief should be considered in malaria program and interventions meticulously. Mostly, a successful control program is indebted to individual ideas. If local people believe in certain strategies, they will participate and behave positively. It means that local beliefs indicate the level of cooperation or non-cooperation with malaria control programs.<sup>7</sup>

Knowledge, attitude and practice (KAP) studies demonstrate that some parameters like literacy level are associated with malaria control behaviors. It is evident that behavioral change is a critical component in the malaria control plans. An appropriate behavior is often determined by measurement of KAP in the community.<sup>8</sup> Some reports have indicated that rural people grasp the risk of malaria, but their knowledge and performance are weak. Furthermore, they adopt wrong decision. Economic, environmental, and social agents thus influence the behavior.<sup>9</sup>

Malaria was widespread in Kazerun, Fars province, south Iran in 2012. Spraying with insecticides was performed in Hakim-Bashi, Jahad-Abad and Jafar-Abad villages. Some 800 mosquito bed-nets were also distributed. At present, the spraying program is regularly done in two stages in this region. The main aim of this study was to assess the knowledge, attitude and practices on malaria transmission and spraying habitats in malaria-endemic villages around Kazerun; find the gaps in malaria control programs; and provide evidence-based information for malaria control policies.

## Materials and Methods

### Study Setting

The present research was conducted in Kazerun, Fars province, Iran. It lies at an altitude of about 860 meters above the sea level with geographical coordinates of 51°39'E, 29°37'N. The setting of this study has a subtropical climate, and agriculture is the main activity of most people. Kazerun is the third most populous part (population=254,704) in an area of 4062 km<sup>2</sup> in this province. Its average annual ambient temperature and precipitation are 28 and 522 mm, respectively.

### Sampling Method

Stratified sampling was performed to select the study samples. Three villages were selected randomly from all villages of Kazerun as follows: Hakim-Bashi, Jahad-Abad and Jafar-Abad. Then, each village was divided into four strata from the available population. All variables were considered in these sub-groups, so that all branches had identical distribution relevant to characteristics. Generally, 10% of this population was incorporated as samples from whom questions were asked.

### Study Design and Data Collection

Collection of data on the level of knowledge and practice of people was carried out through a questionnaire in areas where spraying was routinely undertaken. The questionnaires were completed by health care staff through direct interviews. Each questionnaire comprised demographic characteristics such as sex, age, occupation, and the level of education. Specialized sections consisted of 20 items categorized into 4 factors as follows: facilities and predisposing, knowledge about malaria, indoor residual spraying (IRS), and control/prevention of malaria.

### Data Analysis

The Cronbach alpha was applied to measure the reliability. Validity was evaluated through factor analysis method. All data were analyzed by Chi-squared test. A *P*-value of <0.05 was statistically considered as significant.

## Results

Among all the participants, 192 (92.3%) and 16 (7.7%) were female and male, respectively. Most individuals were in the age group of ≥36 (57.7%) followed by 21-35 (33.65%), 11-20 (6.25%), and ≤10 (2.4%). In terms of occupation, most of the individuals' jobs were housekeeping (24.5%) and self-employment (23.55%). In this survey, the level of education was assessed; 61 (29.3%) participants had elementary school degree and 55 (26.44%) had studied to the middle school level (Table 1).

It is worth mentioning that all houses were supplied with electricity. Moreover, a major portion (99.5%) of them had access to piped water network. Stockyards and animal husbandries coexisted adjacent to 142 (68.26%) of human dwellings. Most (79.3%) of the reservoirs/water tanks were hygienically covered, while 79.8% of window or doors were protected with nets (Table 2).

Health care workers were confirmed to be professional experts to instruct malaria aspects to people. The majority (198, 95.2%) of volunteers declared that malaria disease was transmitted through the mosquito bites. A significant relationship existed between the level of education and item 7 (Could

**Table 1:** Demographic characteristics of the samples in Kazerun, Iran

Characteristics	Category	No. (%)
Sex	Female	192 (92.3)
	Male	16 (7.69)
Age	≤ 10	5 (2.4)
	11-20	13 (6.25)
	21-35	70 (33.65)
	≥ 36	120 (57.69)
Level of Education	Illiterate	25 (12.01)
	Elementary school	61(29.32)
	Middle school	55 (26.44)
	High school	46 (22.11)
	Academic degree	21 (10.09)
Occupation	Housekeeper	51 (24.51)
	Employee	9 (4.32)
	Farmer	32 (15.38)
	Student	11 (5.28)
	Unemployed	13 (6.25)
	Worker	43 (20.67)
	Self-employed	49 (23.55)

**Table 2:** The awareness and attitude towards the facilities and predisposing factors

Item	Answer	Frequency (%)
Is your home equipped with electricity?	Yes	208 (100)
	No	0
Do you access to piped water network?	Yes	207 (99.51)
	No	1 (0.48)
Is there a stockyard or animal husbandry in your vicinity?	Yes	142 (68.26)
	No	66 (31.73)
Do you cover the reservoir/water tank hygienically, if it can?	Yes	165 (79.32)
	No	43 (20.67)
Do you use window net?	Yes	166 (79.8)
	No	41 (19.71)

**Table 3:** The awareness and attitude towards knowledge related to malaria disease aspects

Item	Answer	Frequency (%)
Could you tell me the symptoms of malaria?	Fever	11 (5.28)
	Chill	5 (2.4)
	Fever & Chills	184 (88.46)
	Myalgia	1 (0.48)
	Cramp	2 (0.96)
	I don't know	3 (1.44)
	Others	2 (0.96)

you tell me the symptoms of malaria?), which is categorized into knowledge about malaria, so that fever and chills were the frequent answers related to the hallmark sign of malaria. The value for this symptoms was equal to 184 (88.46%) (Table 3).

Most (151, 72.6%) of the participants stated that mosquitoes lay eggs in the water sources in response to question No. 8 (Where are the breeding places of vectors of malaria?). Of them, 48 (31.78%) were the students of elementary school. Overall, 97 (46.6%) persons answered that mosquitoes bite humans during the day. Moreover, 85 (40.86%) people considered that these dipterans can suck blood over the skin from sunset to sunrise period. Some 202 (97.1%) persons agreed to control malaria through indoor spraying ( $P=0.03$ ). Similarly, 202 (97.1%) of them permitted health providers to spray their houses (Table 4). Bed

nets were the best intervention for the control and prevention of malaria, as mentioned by 69.23% of volunteers (Table 5). Most (190, 91.34%) participants slept inside dwellings. Also, 97.1% of them used air conditioner for ventilation. The Cronbach alpha obtained 6.2. Bartlett significant level was 0.02.

### Discussion

The current survey was performed to assess the basic causes of malaria and factors influenced by protective behaviors against malaria infection. The current findings indicated that most of the respondents were females compatible with their role in nurturing children and staying indoors. This gender bias was in accordance with other previous studies elsewhere.<sup>10</sup> Most respondents were in the age range of 21-35 years old and most of

**Table 4:** The awareness and attitude towards the Indoor Residual Spraying (IRS)

Item	Answer	Frequency (%)
In your opinion, is it necessary to spray dwellings to control malaria?	Yes	202 (97.11)
	No	1 (0.48)
	I don't know	5 (2.4)
Do you let health provider to spray your house in malaria control?	Yes	200 (96.15)
	No	8 (3.84)

**Table 5:** The awareness and attitude towards the control/prevention factor

Item	Answer	Frequency (%)
What do you use to control malaria?	Bed net	144 (69.23)
	Spraying human dwelling	44 (21.15)
	Take a medicine (malaria drugs)	0
	Traditional and herbal medicine	3 (1.44)
	Window net	14 (6.73)
	I don't know	0
	Others	3 (1.44)
Is it necessary to use bed net in open area during summer season?	Yes	202 (97.11)
	No	6 (2.88)

them were housewives or freelance workers; in a similar study in Nigeria, most of the participants were 38-47 year olds and were employed as health care workers.<sup>11</sup> In the present study, the lower age range belonged to a younger community in the study area.

The education level has a critical role in malaria knowledge and acceptance of effective control measures. Individuals with high levels of education would be expected to bear more knowledge and comprehend health concepts more effectively.<sup>5</sup>

It was found that the female education level was a crucial parameter on malaria prevention ability in a report from rural areas of Ethiopia.<sup>12</sup> There was a significant association between the education level and the item 7 on malaria symptoms knowledge including fever and chills ( $P=0.048$ ) in the present survey. The levels of illiteracy (12%) and university degree (10%) were small compared with other education levels. In a similar study from Iran, however, a major proportion (44.2%) of individuals was illiterate.<sup>9</sup> The disparity between these two surveys could be attributed to the differences in spatiotemporal factors.

The result of this survey demonstrated that most houses had piped water system and 79% of water tanks being kept in these places had suitable lids. This conforms to the recent findings in the island of Cape Verde, off West Africa,<sup>13</sup> which is due to the residents' knowledge on malaria disease cycle. A significant majority (88.5%) of participants expressed fever and chills as the main symptoms of malaria disease which reflects their acquired education on this illness in the study area. This was in line with the studies from three different African countries,<sup>14, 15</sup> but in discordance with a study from Saudi Arabia<sup>16</sup> where a lower (<50%) proportion of respondents were aware of these signs.

In the current study, about 97.8% of all participants

used door and window screens to prevent/protect against mosquito bites, but in the above-cited Iranian study, only 9.3% of them had access to these facilities.<sup>9</sup> It is remarkable to note that almost more than 70% of the participants had access to a stockyard or animal husbandry, hygienic water reservoir, piped water network, and electricity. This indicates that the essential prerequisites conducive to the elimination of malaria are already in place which needs only minor efforts to achieve the goal.<sup>1</sup>

In this survey, 95% of the participants knew that malaria disease agent is transmitted through the bites of mosquitoes, which is consistent with other studies elsewhere.<sup>17, 18</sup> Indoor residual spraying (IRS) is one of the most important control strategies preventing vector-borne diseases like malaria.<sup>12</sup>

Most (97%) of the people significantly agreed to the control and prevention of malaria through IRS ( $P=0.03$ ), and most of them (97%) permitted the health care providers to use their premises for IRS. This level of coverage was much higher than that of the World Health Organization (WHO) recommendation (80%) to protect a community against mosquito bites.<sup>19</sup> The IRS coverage in this study is similar to that of the African country of Swaziland<sup>17</sup> and is different from the published reports from a few other countries.<sup>16, 20</sup> High level of IRS in the study areas is influenced by door to door training and information building by healthcare workers.

In the present survey, 69% of the participants stated that bed net usage was the most important method of prevention and control of malaria, which was in agreement with the results obtained in a recent study in South Africa.<sup>21</sup> Some studies show that malaria disease prevalence is higher among people who use only insecticide-treated (impregnated) nets (ITNs) with respect to those who apply both ITNs and IRS to prevent and control malaria.<sup>22-25</sup> Most of the

people slept indoors (91%) and expedited to benefit from cool air conditioning (97%), which represent higher percentages than those in a similar study.<sup>9</sup>

The current survey indicated that people's knowledge, attitude, and behavior could influence the outcome of a control trial. In another recent study on malaria preventive behaviors among housewives in the southern Iranian port city of Bandar-Abbas using the PRECEDE model educational program, a significant difference in the mean scores of knowledge and attitude between the intervention and control groups was found, thus contributing to the preventive behavior on malaria.<sup>26</sup>

The inclusion criteria in this survey comprised all those households who consented to participate in this research. The exclusion criteria involved those individuals who were pregnant, disabled, hospitalized, and unwilling to participate in the study.

On the basis of the current survey, it is recommended that further studies could be undertaken to address the diminutive effects of using ITNs and IRS synergistically to ameliorate malaria disease among the residents and to measure the frequency of *Anopheles* blood sucking activity in this area.

One of the main limitations in this survey was the number of healthcare workers involved in filling out the questionnaires which could give rise to interpersonal variations among them. This was partly resolved by holding pilot educational sessions to advise them on synchronizing their enquiries according to a standard procedure. Another limitation was the probable lack of willingness of the household to take part in this study; this was partly resolved by the cooperation of the health authorities and capacity building.

## Conclusion

It could be concluded that the study population had desirable awareness on malaria disease including its mode of transmission, main symptoms and suitable behavior towards its primary prevention. As discussed above, it is strategically the best practice to implement IRS and ITNs synergistically in hot spots to achieve malaria elimination goal in due time.

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**Conflict of Interest:** None declared.

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