

# Knowledge, attitude and practice (KAP) on malaria, from high malaria burden rural communities, southeastern Iran

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**Abstract** Nowadays, community based control strategies are considered efficient in reaching the malaria elimination goal. For this reason, this study was conducted to access the knowledge, attitude and practice of people on malaria from rural areas with high malaria incidence. In this descriptive–analytic study, a total of 200 rural residents of southeastern Iran were recruited. They were selected based on cluster and simple random sampling methods. Data collection was done using questionnaire with reliability confirmation by Cronbach’s alpha and data was analyzed using SPSS. Mosquito’s bite was answered as the main route of malaria transmission. Also, majority of the participants correctly expressed most important symptoms of malaria. Most of them believed that malaria is preventable and the best strategy for its control is indoor

residual spraying. Very few number of the respondents mentioned sleeping under insecticide treated bed net as a method for controlling the transmission of malaria. Chi square test shows significant difference between the level of education and usage of mosquito nets, but there was no significant difference between the use of bed nets and time of usage. Another significant relationship was seen between malaria infection, use of mosquito nets and place of sleeping at nights during summer. The current study showed the appropriate level of KAP among rural communities in southeast of Iran. Alongside of people’s knowledge and attitudes, their practice about malaria should be increased as an effective factor for achieving to great goal of malaria elimination.

**Keywords** Malaria · Knowledge · Practice · Rural communities · Iran

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## Introduction

Malaria is currently one of the most important health problems in many tropical and sub-tropical countries in the world. Between 2001 and 2015, 1.3 billion malaria cases and 6.8 million malaria deaths occurred globally. Still, 91 countries are considered as malaria endemic areas or where there is a risk of malaria resurfacing (WHO 2017). Of many years ago, malaria has been prevalent and was one of more important disease in Iran (Vatandoost et al. 2009). Now, Iran is approaching malaria elimination. Although malaria cases have been extremely decreased in recent decade, its return is still one of the main concerns of the health system in south and southeastern of Iran (WHO 2017). Presently, more than 95% of malaria cases in Iran are reported from three provinces in south and southeastern

parts of the country (Sistan-Baluchestan, Hormozgan and Kerman). Meanwhile, of these three provinces, Sistan and Baluchestan province has the highest incidence of malaria with over 60% of the total cases of malaria (Raeisi et al. 2013). The high incidence of malaria from two southeastern neighboring malaria endemic countries with Iran (Pakistan and Afghanistan) and the massive influx of citizens of these countries as refugees is believed to play an important role in the high incidence of these areas. Also, climate change, increased rainfall, increasing resistance of plasmodium parasite to chloroquine are some additional factors that are impeding the success of the malaria control program (Sargolzaie et al. 2014). Sarbaz, Nikshahr and Chabahar cities in Sistan and Baluchestan province had the highest incidence of malaria in the last 5 years. Sarbaz County has a very long border with Pakistan and has always been considered as a major problem affecting the success of malaria because of the influx of refugees from the neighbouring endemic country (Raeisi et al. 2013). The current emphasis on malaria control focuses on community-based strategies (Bhutta et al. 2014), so study on people's knowledge, attitude and practice (KAP) can be very useful and valuable in finding a comprehensive strategy for the control of malaria (Hanafi-Bojd et al. 2011). The present study was conducted to determine the KAP of rural communities on malaria in Pishin area of Sarbaz County with the highest malaria incidence in Iran. The results of this study can be useful to malaria control managers as well as health education specialists.

## Materials and methods

This descriptive–analytic study was conducted in 2015 on 200 randomly selected residents from three malaria endemic rural foci (Lad, Laksar and Soldan) in Pishin area-Sarbaz county of Sistan and Baluchestan province of Iran with high malaria burden. For determining the sample size, we first applied cluster sampling method; using stratified sampling method, three villages (Lad, Laksar and Soldan) were selected as clusters. Factors such as been an active focus for malaria, farming, immigration of foreigners, distance from border and also available life facilities were considered for the selection of the villages respectively. Then, using simple random sampling method, a specific number of native persons proportionate to the total number of residents at each cluster were selected that was calculated to be 200 individuals. A semi-structured interviewer-administered questionnaire developed on malaria disease conception was used to collect data. The questionnaire was validated by experts from the department of medical entomology and vector control of Tehran University of medical sciences and experts from Sistan and Baluchestan

health center. The Cronbach's alpha-coefficient of this questionnaire was found to be 0.81, 0.86 and 0.91 for knowledge, attitude and practices respectively. Totally, the questionnaire had 45 questions from different components; demographic characteristics (7 questions), other questions were designed on people's knowledge, attitude and practices of malaria disease conception such as screening, parasitology methods of diagnosis, preventive and control strategies. Before conducting this study, the aim of the study was explained in details and the respondents were assured of the confidentiality of their information. The inclusion criteria were Iranian nationality and voluntary participation. It should be mentioned that Informed consent form based on declaration of Helsinki protocol was taken from all participants. In addition, this study has been approved by ethical committee, Research Deputy, Tehran University of Medical Sciences. The data were analyzed statistically using SPSS version 20, Chi square was used to check for significance association at  $P$  value of  $< 0.05$ .

## Results

Ninety men (45%) and 110 women (55%) were questioned. The mean age of the male and female respondents were  $31 \pm 12.8$  and  $30 \pm 17.8$  year respectively. Data on their demographic, epidemiologic and welfare situation is shown in Table 1. It was found that 93% of the respondents chose mosquitoes' bites as the route of transmission of malaria, while the remaining participants (7%) related transmission of malaria directly to factors such as climatic change, consumption of contaminated food and swimming in rivers and ponds. Majority of the participants (76.50%) correctly mentioned the most important symptoms of malaria include fever, rigors and chills. The rainy season was answered as the period of high malaria prevalence by 63.5% of the participants. The results of the present study show that 62.5% of participants correctly considered the stagnant water to be breeding places for malaria vectors (mosquitoes). Majority of the respondents (90.50%) source of information on malaria was from the community health workers in the village health centers, followed by media (radio, TV), newspapers, teachers and schools at 4, 0, 1.5 and 4% respectively. Sixty-two percent (62%) of the respondents felt the best strategy for control of malaria vectors to be Indoor residual spraying (IRS), while the remaining felt long-lasting insecticidal nets (LLINs) and larviciding as more effective methods for control of malaria at 30 and 8% respectively (Table 2). From the study, 55.50% of the participants believed that malaria is preventable, 23% of the respondents usually sleep under bed nets and 79.50% sleep in the room at nights in summer. Early hours at nights (21–22 h) in summer was considered

**Table 1** Demographic, epidemiologic and welfare characteristics of residents in rural areas, southeastern Iran, 2015

| Characteristics               | Number | Percent |
|-------------------------------|--------|---------|
| Gender                        |        |         |
| Male                          | 90     | 45      |
| Female                        | 110    | 55      |
| Age                           |        |         |
| > 15                          | 24     | 12      |
| 15–30                         | 102    | 51      |
| < 30                          | 74     | 37      |
| Occupation                    |        |         |
| Housewife                     | 90     | 45      |
| Farmer                        | 34     | 17      |
| Student                       | 22     | 11      |
| Worker                        | 12     | 6       |
| Animal husbandry              | 8      | 4       |
| Unemployed                    | 6      | 3       |
| Other jobs                    | 18     | 9       |
| Not stated                    | 10     | 5       |
| Education level               |        |         |
| Illiterate                    | 86     | 43      |
| Primary                       | 90     | 45      |
| Secondary                     | 16     | 8       |
| High school and higher        | 8      | 4       |
| Nationality                   |        |         |
| Iranian                       | 176    | 88      |
| Pakistan                      | 24     | 12      |
| History of previous infection |        |         |
| Yes                           | 22     | 11      |
| No                            | 178    | 89      |
| Electricity                   |        |         |
| Yes                           | 192    | 96      |
| No                            | 8      | 4       |

the best time of hanging the bed nets. Few respondents (7%) wash their mosquito nets regularly while 52.50% wash their nets at will (Table 3). Chi square test shows significant association between the level of education and use of mosquito nets ( $P = 0.014$ ) but there was no significant difference between the level of education and time of usage of mosquito nets ( $P = 0.188$ ). Significant statistical association was also seen between the place of sleeping and resting at nights in summer and history of malaria infection ( $P = 0.05$ ); because most of the participants said they sleep in the compound. Although the results of Chi square test indicated a significant relationship between the use of mosquito nets and the history of malaria infection ( $P = 0.034$ ), however, there was no significant relationship between the time of use of mosquito nets and the occurrence of malaria ( $P = 0.226$ ).

## Discussion

This study revealed that nearly all of the respondents (93%) correctly felt that malaria transmission was caused by anopheles' mosquito bites. This rate indicate that they were well aware of the route of malaria transmission. Previous studies also demonstrated that the awareness of the malaria transmission method was high among residents in southern and southeastern parts of Iran as the endemic foci of malaria. The findings of recent study in Bashagard District, south of Iran showed that 72.7% of the respondents knew the mode of malaria transmission (Hanafi-Bojd et al. 2011). Similarly, the awareness was 58% in 7 districts of Sistan and Baluchestan province; south east of Iran and One-third of the interviewees declared malaria to be the most important disease in their area (Rakhshani et al. 2003). In contrast, in rural Tigray of Ethiopia the awareness was only 48.8% (Paulander et al. 2009). The present study shows that, majority of the participants correctly mentioned the most important symptoms of malaria to be fever, rigors and chills. The cause of shivering in patients with malaria is the invasion and boasting of red blood cells infected with the plasmodium parasites, which is the first symptom of the disease. Due to the boasting of infected red blood cells, the parasites are released into the blood circulation in form of merozoites causing the fever (Garcia et al. 2001). In agreement with previous studies, 63.50% of the respondents were aware that malaria is more common in rainy season than other seasons. Previously, in many scientific researches it was confirmed that there is a direct relationship between malaria transmission and some climatic factors such as rainfall (Odongo-Aginya et al. 2005; Abiodun et al. 2016; Gao et al. 2012). For instance, some researchers indicate strong positive correlation for malaria cases lagging 0–3 months after rainfall in Sri Lanka (Briët et al. 2008). Furthermore, in a study from South of Iran shows the most effective climatic factors on the malaria incidence is temperature. In contrast, they found that humidity and rainfall were not significant in this study (Mohammadkhani et al. 2016). Sixty-eight percent of the participants agreed that malaria is more prevalent in warm months. A possible explanation for this scientific fact is that warmer temperatures reduces the gonotrophic cycle and the pathogen's maturation period in anopheles' mosquitoes. However, very hot and dry weather may also reduce mosquitos' longevity (Blanford et al. 2013). The results of our study show that 62.5% of the participants correctly considered stagnant water to be breeding places for malaria vectors. The malaria vectors usually lay their eggs in stagnant waters and the increasing of these breeding places, lead to the increase of mosquito's and increase in anthropophilic index. This finding was previously confirmed (Conde et al.

**Table 2** Knowledge of participants about malaria in rural areas, southeastern Iran, 2015

| Question   | Answers  | Number | Percent |
|--|--|--------|---------|
| What are the most important symptoms of malaria?                       | Fever, chills  | 153    | 76.50   |
|  | Headache, joint pain   | 27     | 13.50   |
|  | Nausea, abdominal pain   | 6      | 3       |
|  | I do not know  | 14     | 7       |
| What is the mode of transmission for malaria?                          | Anopheles mosquito bites   | 186    | 93      |
|  | Related to Climatic condition                                    | 8      | 4       |
|  | Related to eating contaminated food                              | 4      | 2       |
|  | Related to swimming in rivers and ponds                          | 2      | 1       |
| In which season of year (in terms of rainfall) malaria is more common? | Rainy  | 123    | 63.50   |
|  | Dry  | 28     | 14      |
|  | It's no different  | 45     | 22.50   |
|  | I do not know  | 38     | 19      |
| What month (s) of the year malaria is prevalent?                       | Warm   | 136    | 68      |
|  | Cold   | 8      | 4       |
|  | It is no different   | 24     | 12      |
|  | I do not know  | 32     | 16      |
| What is the source of your information about malaria?                  | Radio and TV   | 8      | 4       |
|  | Newspaper  | 0      | 0       |
|  | Teachers and schools   | 3      | 1.5     |
|  | By community health workers in the health houses in the villages | 181    | 90.50   |
|  | By other people  | 8      | 4       |
| What is the best strategies for malaria vectors control?               | Indoor residual spraying (IRS)                                   | 124    | 62      |
|  | Larviciding  | 16     | 8       |
|  | Fogging (area spraying)  | 0      | 0       |
|  | Others (long-lasting insecticidal nets (LLINs))                  | 60     | 30      |
| Where is the breeding place of malaria vector mosquito?                | Standing water   | 125    | 62.50   |
|  | Garbage  | 8      | 4       |
|  | Soil   | 2      | 1       |
|  | I do not know  | 65     | 32.50   |

2015; Spiers et al. 2002). Also, majority of the respondents mentioned the source of their information on malaria to be by health workers. In addition, most of the respondents (77%) expressed that they usually go to the health houses when they have symptoms of malaria. This assertion confirmed previous study that was done in Bashagard district village, Hormozgan province, south of Iran (Hanafi-Bojd et al. 2011). In Persian, these health workers are called Behvarz, they provide primary health care in villages and rural areas of Iran; regions with residents commonly less than 5000 people and their main economic activity are agriculture and animal husbandry (Farzadfar et al. 2012). The role of health workers is important in the promotion of people's health. They are also involved with other health issues such as national vaccine coverage, screening for diabetes, hypertension and blood sugar control

(Javanparast et al. 2011; Lankarani et al. 2013). In Iranian malaria areas, the health centers are considered as the most peripheral and primary level of health care. For this reason, it is logical that source of people's information be based on community health worker's education. In the current study, most of respondents were of the opinion that the best strategy for malaria vectors control to be Indoor residual spraying (IRS). On the other hand, based on our results, majority of participants prefer staying inside their rooms during summer nights. In malaria regions of Iran, most of the anopheles' malaria vectors are endophilic; therefore, one suitable strategy for controlling adult mosquitoes is the IRS in the houses and the use of mosquito bed nets (Nejati et al. 2017). Although 70% of the respondents are aware of using, bed nets but only 23% of them usually hang it for sleeping at night. It was revealed that the main reasons for

**Table 3** Attitudes and practices of participants regarding malaria in rural areas, southeastern Iran, 2015

| Question  | Answers                     | Number | Percent |
|---|-----------------------------|--------|---------|
| Do you think malaria is a preventable disease?  | Yes                         | 111    | 55.50   |
|   | No                          | 23     | 11.50   |
|   | I do not know               | 66     | 33      |
| Do you use bed net during sleeping (at night)?  | Yes, usually                | 46     | 23      |
|   | Yes, some times             | 94     | 47      |
|   | No                          | 60     | 30      |
| What time of the night do you hang the bed net? | 21–22                       | 80     | 40      |
|   | 22–23                       | 46     | 23      |
|   | 23–24                       | 10     | 5       |
|   | 24–01                       | 4      | 2       |
|   | Not at all                  | 60     | 30      |
| Where do you rest in the summer nights?         | Room                        | 159    | 79.50   |
|   | Porch                       | 2      | 1       |
|   | Yard                        | 33     | 16.50   |
|   | Rooftop                     | 6      | 3       |
| Do you wash the mosquito net?                   | Yes                         | 14     | 7       |
|   | Sometimes                   | 105    | 52.50   |
|   | No                          | 81     | 40.50   |
| Where do you refer for malaria treatment?       | Health houses               | 154    | 77      |
|   | Governmental health centers | 38     | 19      |
|   | Hospital                    | 0      | 0       |
|   | Doctors' offices            | 2      | 1       |
|   | I do not know               | 6      | 3       |

not using mosquito nets are reduced air entering, heat, supposition on low mosquito population and sleeping elsewhere, or not sleeping at all (Pulford et al. 2011). Chi square test show significant association between the education level and use of bed nets, but there was no significant difference between the times of bed nets hanging. In other previous studies, the relationship between the educational level and the use of mosquito nets for malaria prevention was proven. It has been found that there was statistically significant difference between highly educated mothers and those with lower educational qualification in terms of ITN awareness (Edelu et al. 2010). Similarly, it has been shown that there was a significant relation between educational level and use of bed nets for malaria control among pregnant women in Nigeria (Ezire et al. 2015). In previous studies, *Anopheles culicifacies* (*An. culicifacies*) and *An. stephensi* were identified as the main vectors of malaria in this area. As a scientific fact, the time of using bed nets for malaria prevention was stated to be from the onset of the *Anopheles* activity until the end of their blood-sucking activities i.e. from sunset to sunrise of the next day (Nejati et al. 2013). In this present study less than half of the respondents (40%) declared that they used

bed nets from 21 to 22 pm. While, it was shown that most of the malaria vectors (65.9%) in Southeast of Iran such as *An. stephensi*, *An. culicifacies*, *An. dthali* and *An. fluviatilis* were active at the first half of the night 18:00–22:00 (Yeryan et al. 2016). So it can be concluded that one of the important strategies for malaria control, is the use bed nets especially at the first half of the night thereby reducing the exposure of people to *Anopheles* biting. Previous studies from different areas of the world have shown that people who reside in rural areas have a good perception of morbidity risk of malaria, while their knowledge, attitudes and practices in terms of their health seeking behavior are weak (Williams and Jones 2004). According to the results of current study the level of KAP among rural communities in southeastern of Iran with the highest malaria incidence was appropriate. Alongside, people's knowledge and attitudes, their practice about malaria should be increased by continuing education for people at risk of malaria, as well as training physicians and health personnel who are responsible for educating people. People's participation has an important role for malaria elimination in each country involved with this disease and increasing of their KAP on malaria can be effective for achieving this great goal.

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### Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

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