



Knowledge, attitude and practice about malaria in south-western Saudi Arabia: A household-based cross-sectional survey



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ABSTRACT

This study aimed to assess the level of knowledge, attitudes, and practices (KAP) concerning malaria and malaria prevention among rural populations residing in the southwestern region of Saudi Arabia. This was a household-based cross-sectional survey, using structured questionnaire that was developed and distributed among households selected randomly from 19 villages (clusters) located in a southwestern region of Saudi Arabia, north of the border with Yemen. The data collected were analyzed using SPSS version 20. A majority of respondents (98.4%) reported that they had heard about malaria, but only 21.7% reported that they had sufficient information about the disease. Surprisingly, the most popular source of information was the internet and social media (proportion responding positively in parenthesis) (25.5%), followed by family (21.7%), while information from health facilities contributed only 12.4%. A majority of respondents were aware that malaria is a communicable (89.1%) and deadly (70%) disease; however, only 30.2% of the respondents responded that malaria is a treatable disease. Almost all of the aware respondents (97.5%) were inclined to seek treatment from health facilities, and 63.2% preferred to seek treatment within 24 h of presenting with symptoms. Regarding personal precautions, the most common practice adopted by respondents was indoor residual spraying IRS (47.3%), followed by anti-mosquito spraying (29.8%), mosquito bed nets (13.2%) and combined anti-mosquito sprays and nets on windows (4.7%). This KAP study did not show any statistically significant differences in KAP due to age; however the practices of preventive measures against malaria differed significantly by nationality (Saudi versus non-Saudi). We conclude that most populations living in the villages have an acceptable level of knowledge and awareness about malaria and seek timely treatment. However, the positive attitudes and practices in relation to personal protection and prevention measures against malaria require marked improvement. The obvious gap between the knowledge and practice related to malaria prevention requires innovative strategies based on local evidence that well suits the local circumstances to promote and encourage the adoption and practice of personal protective measures.

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Abbreviations: KAP, knowledge, attitude, practices; SD, standard deviation; LSDI, Lubombo Spatial Development Initiative.

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Background

Malaria, a febrile illness affecting people of all age groups, is endemic in 109 countries, spanning all continents, with the exception of Australia and Antarctica [1]. It is often fatal in children under the age of five years; however, the mortality rate in adults is not as high because adults have a better immune response than children [1]. Approximately 300 million people are affected by malaria resulting in the deaths of 1–1.5 million people every year [2]. This preventable disease represents a dual burden in that it places an increased challenge on the health system and economic stress on individuals and the community as a whole [3]. *Plasmodium falciparum* is the predominant parasite strain causing malaria in Saudi Arabia and Yemen [5].

According to the World Health Organization's (WHO) the strategic plan for malaria control and elimination for the period 2006–2010 revealed that in the Eastern Mediterranean region, 6.1 million cases of malaria were reported in 2000, 4.5 million cases in 2003 and 2.7 million cases in 2005 [4]. Every year, 10.5 million cases and 49,000 deaths are reported in the Eastern Mediterranean region alone. Although Saudi Arabia has a low incidence of malaria overall, certain areas that share borders with other countries like Yemen where malaria is hyper endemic still have a high prevalence. Thus, in areas such as the Jazan region in the southwestern part of the country, malaria is still hyper-endemic for several reasons, including the climate that is conducive to mosquito breeding in addition to the continuous importation of malaria cases from Yemen [5].

Saudi Arabia is in the stages of malaria pre-elimination and elimination. The WHO report of 2010 documented a 50% reduction in malaria cases in the country between 2000 and 2009 showing good progress in the country's efforts to get rid of malaria [5]. Studies conducted in 2001 and 2006 indicated that the eastern province of Saudi Arabia is free of indigenous malaria transmission [6,7]. However, some official statistics show that malaria cases continue to be imported into the country. From the period 1990 up to and including 1999 the number of documented malaria cases in Saudi Arabia was 206 of which 93% were reportedly associated with a history of travel to the southwestern region of the kingdom [6]. From January 1994 to 2005 no indigenous cases were reported but approximately 56 cases of imported malaria were identified at a site in the eastern province of Saudi Arabia [7]. In 2013, the Saudi Ministry of Health (MoH) reported 2513 cases nationally, most of which occurred in the Jazan region [12]. The Jazan area is known for hyper-endemic transmission of malaria due to continuous importation of cases from Yemen. As the situation in Yemen continues to deteriorate, we believe that more cases will likely be imported from that area into Jazan in the near future.

Various studies have shown that improving community knowledge, attitudes and practices (KAP) can play an effective role in preventing and controlling febrile diseases such as malaria. For example, the Lubombo Spatial Development Initiative (LSDI) established a close collaboration between Mozambique, Swaziland and South Africa, which aim at controlling the spread of malaria in Africa. The study promoted the use of spraying indoor surfaces with insecticides (IRS) and successfully reduced the burden of malaria in this region [3,8]. Another LSDI study conducted in 2009 reported good knowledge of malaria among the participants and good IRS coverage in sentinel sites in Swaziland in compliance with WHO recommendations [9]. A study conducted in 2005 demonstrated a moderate-to-high level of awareness and a successful implementation of protective practices among study participants living in India [10]. A cross-sectional study of 1330 households in rural areas of Nepal conducted in 2004–2005 showed that 86% of participants had heard about malaria. However, they had limited knowledge about the preventive measures such that only 4% of the participants

demonstrated any knowledge of the importance of using insecticide impregnated bed nets and only 23% of these individual actually used nets [11].

Although numerous studies to assess the level of malaria KAP have been done in different regions of the world, to the best of our knowledge, no studies have been reported in the southern part of Saudi Arabia. Therefore, we conducted this household survey to assess the level of malaria KAP of the people living in southwestern Saudi Arabia. The ultimate goal was to provide local evidence to inform policy makers in developing strategies to reduce the incidence of malaria in this region. This study provides baseline data for future investigations regarding malaria prevention and control. The study findings also provide baseline data that could be used for evaluating the effectiveness of strategies following implementation of malaria control programs.

Methods

Study setting

The study was conducted in 19 villages (clusters) selected randomly in the Jazan region located in the southwest corner of Saudi Arabia. The area is located directly north of the border with Yemen, close to the Red Sea coast and occupies approximately 14,000 km². The population of Jazan is approximately 1.5 million people. Appendix A shows the maps of the study area.

Study design, data collection and ethical approval

This was a household based cross-sectional survey. A structured questionnaire was developed and administered to 258 selected households with a total of 1374 residents in the 19 cluster of randomly selected villages. The selected interviewee was the head of household; however, if they were not available on the interview date, any other adult older than 18 years was interviewed. The structured interview questionnaire was administered at the home of the respondent by a trained research team. The questionnaire contained 34 questions consisting of two parts. The first part was designed to obtain background information including demographic characteristics (age, gender, and relationship to the head of the family, number of family members, level of educational qualification, history of previous malaria infection and history of travel to endemic areas). The second part of the survey consisted of questions that addressed the KAP concerning malaria. The study proposal was approved by the Ethics Committee of Jazan University Medical Research Center, the institute that also provided us with the technical support to assist with data collection and data entry.

Data analysis

The data collected were analyzed using SPSS version 20. For categorical variables, data were presented as frequencies and percentages, while for continuous variables data were presented as mean \pm standard deviation (SD). The differences between respondents' characteristics were analyzed using chi-squared test, and *P*-values of ≤ 0.05 were considered statistically significant.

Results

Background of respondents

Table 1 shows the characteristics of the 258 respondents and their households. The mean age of respondents was 26.7 ± 16.6 years. A majority of respondents were male (93.8%), and more than two-fifths (41.5%) belonged to the 20- to 40-year-

Table 1
Background characteristics of study respondents (N = 258).

Variable	Number	% of 258
Gender		
Male	242	93.8
Female	16	06.2
Age group (mean \pm SD) 26.7 \pm 16.6		
Less than 20	17	06.6
20–40	107	41.5
41 and above	134	51.9
Education level		
Illiterate	41	15.9
Literate	25	09.7
Elementary/primary level	71	27.5
High school and above	118	45.7
Others	3	1.2
Type of the walls in the home		
Cement blocks	66	25.6
Stone and cement	167	64.7
Other ^a	25	09.7
Village name		
Alhagla	28	10.85
Alqayem	21	8.14
Hakema Aldagharir	10	3.88
Ganboorah	34	13.18
Ramadat Kholab	26	10.08
Samta	1	0.39
Aloqda	10	3.88
Alrawajha	8	3.10
Alsh'afoli	5	1.94
Alghfaqi	3	1.16
Alma'ada	7	2.71
Rasha	21	8.14
Alnafee	8	3.10
Asshugairy	16	6.20
Al Aydabi	30	11.63
Damad	8	3.10
Khumyah	5	1.94
Alqumry	5	1.94
Az Zarqa	12	4.65
Source of exposure to malaria		
Imported cases	33	12.8
Endemic area	225	87.2

^a Clay, fire bricks, stone and mud, stick and mud or not specified.

old age group. In total 45.7% of the respondents were educated to high school level or above, 27.5% had an elementary or primary education, 9.7% were literate but had had not been to school and 15.9% were illiterate (could not read and write and had never been to school). The study respondents were from many different small villages. Most participants (proportion in parenthesis) were from Ganboorah, Al Aydabi, Alhagla and Ramadat Kholab (13.18%, 11.63%, 10.85%, and 10.08%, respectively). Of the 258 respondents a majority (64.7%) had residences constructed with stone and cement and the remaining were constructed with cement blocks or other materials (25.6% and 9.7%, respectively). The majority of respondents (87.2%) believed that malaria is endemic in the local area and was not imported (see Table 1).

Knowledge and awareness

We assessed the knowledge and awareness of respondents regarding malaria transmission based on their responses to our questionnaire (Table 2). We found that almost all (98.4%) participants had heard about malaria, but only 21.7% reported that they had sufficient information about the disease. Surprisingly, the primary source of information about malaria was the internet and social media (25.6%) followed by family (21.7%), while information from health facilities represented only 12.4%, followed by school

Table 2
Knowledge and awareness about malaria among all study participants (N = 258).

Variable	Number	%
Have heard about malaria?		
Yes	254	98.4
No	4	1.6
Do you think you have sufficient information about malaria?		
Yes	56.0	21.7
No	202	78.3
Sources of information		
Friends	28	10.9
Family	56	21.7
Newspaper and posters	31	12.0
Internet and social media	66	25.6
Schools	31	12.0
Health facilities	32	12.4
Others (mosques, etc.)	9	5.4
Are aware of the following malaria symptoms?		
Headache	26	10.0
Fever	130	50.4
General pain	25	9.7
Coldness	27	10.5
Vomiting	30	11.6
Others (weakness, loss of appetite, dizziness)	20	7.8

and newspapers and posters, and friends, which represented 12.4%, 12.0 and 10.9%, respectively.

As shown in Table 3, 89.1% of study respondents were aware that malaria is a communicable disease, and 70.2% considered malaria a deadly disease. Approximately half of the respondents (50.4%) reported that fever was the most common symptom of malaria. Other symptoms such as vomiting, feeling cold, headache and pain were less frequently reported as the most common symptoms as cited by 11.6%, 10.5%, 10.0% and 9.7% of the respondents respectively. Only 30.2% of the respondents were aware that malaria is a treatable disease. No statistically significant differences by age group (≤ 40 years versus > 40 years), were observed in the level of knowledge and awareness about different aspects of malaria, except in the regarding the knowledge about malaria being a deadly disease (Table 3).

Attitudes and practices

Table 4 shows the respondents' attitudes towards prevention of malaria. Regarding the respondents' history of malaria only 15.1% of respondents reported that they had suffered from malaria. A larger proportion of the respondent (85.7%) had never traveled to a malaria-endemic area. Almost all respondents (97.5%) were aware of the importance of seeking treatment from health facilities, and 63.2% indicated that they would seek treatment within 24 h of presenting with symptoms. Regarding personal precautionary procedures, the most common practice adopted by 47.3% of respondents was the use of IRS, followed by anti-mosquito spraying (29.8%), mosquito bed nets (13.2%) and anti-mosquito sprays and nets on windows (4.7%). More than half of the study respondents (77.9%) reported that they did not have mosquito bed nets in their houses (see Table 4). There were no significant differences in attitudes between age groups (≤ 40 years versus > 40 years) regarding the use of protective measures.

We compared the use of precautionary practices to prevent the spread of malaria based on the nationality of the respondents. Only a few Saudis reported using mosquito nets for children under the age of 5 years, while none of the non-Saudis did. Of the 258 respondents, less than half (45.7%) reported that their houses were sprayed with mosquito repellants and more than half of respondents (56.6%) were completely unaware of the efforts of the MoH to protect them against malaria. Overall, the use of precautionary

Table 3
Knowledge and awareness of malaria among different age groups among the study participants (N = 258).

Knowledge of malaria	Total	Age group		P-value
		≤40 years n = 124	>40 years n = 134	
Heard of malaria (N, %)				0.623
Yes	254(98.4)	123(99.2)	131(97.8)	
No	4(1.6)	1(0.8)	3(2.2)	
Malaria is a communicable disease (N, %)				0.217
Yes	230(89.1)	113(91.1)	117(87.3)	
No	28(10.9)	11(8.9)	17(12.7)	
Malaria is a deadly disease (N, %)				0.019
Yes	181(70.2)	88(71.0)	93(69.4)	
No	30(11.6)	20(16.1)	10(7.5)	
Don't know	47(18.2)	16(12.9)	31(23.1)	
Symptoms of malaria (N, %)				0.399
Headache	26(10.1)	15(12.1)	11(8.2)	
Fever	130(50.4)	64(51.6)	66(49.3)	
Pain	25(9.7)	7(5.6)	18(13.4)	
Coldness	27(10.5)	13(10.5)	14(10.4)	
Vomiting	30(11.6)	15(12.1)	15(11.2)	
Others (weakness, loss of appetite, dizziness)	20(7.8)	10(8.1)	10(7.5)	
Sufficient information about malaria (N, %)				0.986
Yes	56(21.7)	27(21.8)	29(21.6)	
No	180(69.8)	87(70.2)	93(69.4)	
Don't know	22(8.5)	10(8.1)	12(9.0)	
Malaria can be treated (N, %)				0.140
Yes	78(30.2)	33(26.6)	45(33.6)	
No	180(69.8)	91(73.4)	89(66.4)	

Table 4
Attitudes towards precautionary prevention against malaria among the study participants (N = 258).

Attitudes of the study participants	Total	Age group		*P-value
		≤40 years n = 124	>40 years n = 134	
Where to seek treatment (N, %)				0.457
Health facility	251(97.5)	120(96.8)	131(97.8)	
Other (traditional treatment, pharmacy)	7(2.5)	4(3.2)	3(2.2)	
When to seek treatment (N, %)				0.104
Within 24 h	163(63.2)	85(68.5)	78(58.2)	
2–3 days	77(29.8)	35(28.2)	42(31.3)	
4–6 days	10(3.9)	2(1.6)	8(6.0)	
≥7 days	8(3.1)	2(1.6)	5(4.5)	
Personal precautions measures (N, %)				0.479
Anti-mosquito spray	77(29.8)	37(29.8)	40(29.9)	
Nets on windows	12(4.7)	8(6.5)	4(3.0)	
Indoor residual spraying (IRS)	122(47.3)	15(12.1)	19(14.2)	
Mosquito bed net	34(13.2)	60(48.4)	62(46.3)	
Others (cow dung, closed doors)	13(6)	4(3.2)	9(6.7)	
Mosquito bed-nets available at home (N, %)				0.675
Yes	57(22.1)	26(21.0)	31(23.1)	
No	201(77.9)	98(79.0)	103(76.9)	

* P-value; Chi-square/Fisher Exact Test estimation.

practices among the Saudi and non-Saudi participants showed a statistically significant difference in the adoption of three of the four personal precautionary measures that were included in the questionnaire, which included the 'use of nets by families', 'number of family members using the nets' and 'use of house spray' (P-values: 0.014, 0.013 and 0.005, respectively) (Table 5).

Discussion

To the best of our knowledge, this is the first household-based, cross-sectional study on the knowledge, attitudes and practices regarding malaria conducted in villages in the southwestern Saudi

Arabia. The knowledge, attitudes and practices identified could be used as a baseline data to evaluate future tools and strategies formulated to prevent, control and/or eradicate malaria in the study area, and other similar areas.

Although most of the participants reported they were aware about malaria, only 21.7% had sufficient information about malaria. Surprisingly the main source of information was the internet and social media. The family, health facilities and schools were less utilized as a source of information. These results are in contrast to the findings from a study conducted in Swaziland in 2009 that reported healthcare facilities as the primary source of malaria information [9]. A possible explanation for the results of our study is that the

Table 5

Practices to prevent the spread of malaria based on participant nationality (n = 258).

Practices of the study participants	Total	Nationality		*P-value
		Saudi	Non-Saudi	
Family members use a mosquito bed net (N, %)				0.01
Father	18(7.0)	11(5.2)	7(15.2)	
Mother	1(0.4)	1(0.5)	0(0.0)	
Children aged ≥5 years	5(1.9)	4(1.9)	1(2.2)	
Children aged <5 years	14(5.4)	14(6.6)	0(0.0)	
Others	19(7.4)	12(5.7)	7(15.2)	
Not applicable	201(77.9)	170(80.2)	31(67.4)	
Number of family members using mosquito bed net (N, %)				0.01
Equal to number of family members	24(9.3)	14(6.6)	10(21.7)	
<Number of family members	31(12.0)	26(12.3)	5(10.9)	
>Number of family members	3(1.2)	3(1.4)	0	
Not applicable	200(77.5)	169(79.7)	31(67.4)	
All mosquito nets used by the family (N, %)				0.09
Yes	40(15.6)	28(13.3)	12(26.1)	
No	17(6.6)	14(6.6)	3(6.5)	
Not applicable	200(77.8)	169(80.1)	31(67.4)	
Indoor residual spraying (N, %)				0.01
Yes	118(45.7)	88(41.5)	30(65.2)	
No	140(54.3)	124(58.5)	16(34.8)	
Knowledge of Ministry of Health efforts to control malaria in the region (N, %)				0.25
Yes	112(43.4)	96(45.3)	16(34.8)	
No	146(56.6)	116(54.7)	30(65.2)	

* P-value, Chi-square/Fisher Exact Test estimation.

respondents' answers reflect the impact of technological advancements on public health. However, the potential risks that may be associated with the accessibility and use of open communication (i.e., social media) should not be ignored, despite the fact that it is currently a readily available and accessible source of information on a previously unfamiliar disease. Fever was reported as the most common symptom of the disease known to the respondents, followed by pain, vomiting, feeling cold and weakness. This finding is consistent with findings in other studies [9,12–14].

Our study showed that more than half of the respondents believed that malaria is a communicable and deadly disease. A similar KAP study conducted in Nepal also reported that the majority of respondents believed that malaria was a deadly disease [11]. As far as public health information on communicable diseases including malaria is concerned, approximately 70% of the participants in our study believed that they did not have sufficient knowledge about malaria, and a similar proportion thought that it was not a treatable disease. These findings are inconsistent with a previous study that reported that 78.1% of participants believed that malaria was preventable [9]. Most of the respondents were open to receiving information about measures for the prevention and treatment of malaria. It can be speculated that the relatively high frequency of illiteracy among participants (15.9%) plays an important role in limiting the acquisition of knowledge or awareness about malaria which is an uncommon disease in the study area. Nevertheless, despite the level of illiteracy, participants showed interest in learning more about malaria. Thus communicable diseases awareness programs and other teaching strategies should be developed and implemented to educate and increase the public awareness of this disease.

Our results indicate that studies on attitudes and practices related to malaria prevention and treatment is rare in Saudi Arabia possibly because of the comparatively low burden of malaria compared with the burden of non-communicable diseases such as diabetes, cardiovascular, obesity, among other more prevalent diseases. In this study, we have attempted to systematically collect and synthesize information regarding attitudes and practices related to malaria awareness, prevention and burden in this part

of the world. We hope this information can be used to develop and evaluate intervention measures.

We found that almost all participants (97.5%) seek treatment for malaria from healthcare facilities, with more than half seeking treatment within 24 h of presenting with symptoms. These findings are consistent with a study conducted in Swaziland in which 320 randomly selected households were involved. However, the findings of our study are in contrast with reports from other countries in sub-Saharan Africa, where the first-line of treatment is sought from non-official sources. The high percentage of respondents seeking treatment at healthcare facilities, as reported in our study, suggests a good availability of health services and accessibility of healthcare facilities in the study region [12,14,17]. However, contrary to our findings, a study conducted in Nepal showed that participants preferentially consulted traditional healers suggesting a lack of appropriate facilities and lack of awareness in that region [11].

Regarding the adoption of personal precautionary measures by participants in this study, mosquito nets were the most commonly used protective equipment, followed by anti-mosquito sprays (47.3% and 29.8%, respectively). More than half of the study participants reported that they did not have mosquito nets in their houses. These proportions are lower than those reported by participants in a study conducted in Swaziland, where 87.2% of respondents reported using mosquito nets while 38.8% reported using anti-mosquito sprays [9]. Furthermore, our findings showed that there is a significant difference between Saudis and non-Saudis in the proportion of respondents who used mosquito bed-nets for children under the age of 5 years. A possible explanation may be that non-Saudi individuals do not have access to the mosquito bed-nets from public health facilities. This study also revealed significant differences in the practices to protect from mosquito bites, such as the use of mosquito nets and house sprays used by respondents in the Saudi and non-Saudi groups. These findings may provide information to public health policy makers to reconsider the actual reasons behind difference in the use of protective practices and thus create strategies that will provide universal coverage of preventive measures against malaria regardless of the population's

background. This would help to achieve the elimination and eradication of malaria in Saudi Arabia, especially in the southern region of the country.

In our study, 29.8% of participants reported using mosquito nets on windows, while this measure was adopted by only 9.3% of participants in a study conducted in Iran [15]. More than half of the respondents in the present study reported that their houses were not sprayed with mosquito repellants. While this finding is consistent with those of a study conducted in Nepal [11], our results are far short of WHO guidelines, which recommend that more than 80.0% of households within targeted communities should be sprayed against mosquitoes [16]. More than half of the study respondents were completely unaware of the efforts of the MoH of the Saudi Government to reduce malaria incidence. This finding indicates either a lack of knowledge or the inadequacy of preventive strategies implemented by the MoH.

Study limitations and strengths

This study provides the first evidence of the KAP concerning malaria conducted in large rural populations randomly selected from well-populated villages in the southwestern region of Saudi Arabia, known to be at relatively high risk of exposure to imported cases of malaria. However, possible limitations of the study include the use of a subjective tool to assess the KAP of participants and also the cross-sectional study design, which makes it difficult to determine any causative relationship. Nevertheless, this was a strategic approach to assess the baseline information regarding KAP related to malaria prevention and treatment.

Conclusion

Most of the respondents had an acceptable level of knowledge and awareness about malaria, and indicated that they would seek treatment quickly if they developed symptoms. However, the attitudes and practices in relation to malaria prevention still need improvement. Thus, we recommend that a set of local strategies should be formulated to promote the implementation of prevention and control measures aimed at minimizing the exposure, occurrence and spread of malaria and to promote positive attitudes and the best protective practices available. Further studies are required to confirm and extend the findings of the current study.

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Competing interests

None declared.

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Appendix A. Maps of study setting.



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