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Awareness and risk behaviors of malaria among hail population, kingdom of Saudi Arabia

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Abstract
Background: The current work was done to detect the knowledge and the behavioral practice about malaria and among Hail populations, Saudi Arabia.
Material & Methods: A cross-sectional survey was done using structured questionnaire that was distributed among 1300 participants selected randomly from Hail region.
Results: The results of the present study revealed that although most of the participants (67.0%) reported they were aware about malaria, however, their depth of knowledge was poor as regards the causative agent (7%), prophylaxis (5.5%) and treatment of malaria (25%). Unexpectedly, 68.0% of the respondents thought wrongly that malaria is treated by herbal preparation. Approximately 75.4 % of the participants in the present study thought that it was not a treatable disease and 82% of them believed that malaria is preventable. As expected, the main source of information was the internet and social media (78%). Although majority of the respondents associated the cause of malaria with mosquito bite, 52.2%, 43.1 %, 33.6 %, 44.7%, 58.6% of respondents believed wrongly that flies bites, Consumption of raw or inadequately cooked meat,sneezing or coughing, Consumption of unwashed vegetables and fruits, and physical contact can transmit malaria. respectively. In the current work, unfortunately knowledge about clinical manifestation was very deficient as demonstrated that 26.3% of contributors only knew that malaria cause regular fever whereas, 42.3%, 33.46% and 28.0% knew that malaria cause headache, coldness and shivering respectively. Surprisingly 28.2 % of respondents thought wrongly that malaria can cause eczema. Unfortunately, only 39.6% of participants sought treatment for malaria from hospitals or health facilities, 19% from pharmacists and 20% from relatives and friends' advices. 57.1 % however sought traditional treatment. As regards personal prophylactic measures practiced by participants in the present study, 50.1% of people used to spray the anti-mosquito sprays and unfortunately,only 11% of the current study participants reported that they have mosquito nets in their houses. In the present work, only 9.46 % of the participants used to rub with skin repellant.
Conclusion: In conclusion, the current study proved that Hail population have low level of knowledge as well as they are lacking the necessary preventive behavior to malaria infection. However, most of the preventive behaviors that are applied could be explained by the economic, and cultural habits in the region. Furthermore, the physicians should be at the first line to educate people about mode of transmission. Moreover, the current study could put a baseline information regarding knowledge and behavioral practice related to malaria disease.

Keywords: malaria, hail, knowledge, behavioral practice

Introduction

Malaria is considered a worldwide distributed affecting more than one million every year specially in in the tropical and sub-tropical countries. It is caused by the protozoan parasite, *Plasmodium* spp affecting people of all age groups (World Health Organization, 2008) [32] (World Health Organization, 2011a). Transmission of malaria is mainly by female *Anopheles* mosquito bites, however, other malaria infection routs are trans placental route, blood transfusion and the rarely parenteral or needle-stick injuries (World Health Organization, 2011b) [34]. Four species of *Plasmodium* parasite can infect humans under favorable conditions, these *are: P. falciparum*, *P. vivax*, *P. ovale* and *P. malariae* (Spinello *et al*., 2012) [29].In humans, *Plasmodium falciparum* is the most dangerous species responsible for severe disease and it is the predominant parasite strain causing malaria in Saudi Arabia and Yemen(World Health Orgnization,2010) (Idro *et al*, 2007).

Malaria incidence in Saudi Arabia is relatively low and is represented along the South region of the Red Sea coast to the down border of Yemen where malaria is hyper endemic there (World Health Orgnization,2010) [33, 35]. The economic strategic position of Saudi Arabia offering employment to millions of people from countries known to be endemic for

malaria and the millions of people coming from all over the world to perform Hajj make the country susceptible to malaria importation (Warrell *et al*, 1993). [30]

Malaria is a fatal disease specially in children under the age of five year, pregnant women and non-immune persons. The clinical manifestations of malaria of include fever, rigors and sweating. The causes of death are often anemia and cerebral complication (Quintero *et al*., 2011) [25] (Malik *et al*, 1998) [18] (Ohalete *et al*, 2011) [22].

Unfortunately, no successful vaccine is available, and most of the strains of malarial parasite are becoming resistant to available anti-malarial drugs - quinine (Bloland, 2001) [2] and artemisinin derivatives,

(Duff PE and Sibley CH, 2005) [7]. The prevention and control program according to WHO includes killing of reservoirs, health education for public people, vector control using larvicides in regular periods, spraying space with insecticide for killing of mosquitoes, immediate treatment of malaria cases and training the health workers on how to prevent the spreading of malaria (Phillips, 2001; Memish *et al*., 2014) (Oladeinde *et al*, 2012) [24, 20, 23].

Prevention of the disease through better knowledge and awareness is the best way to prevent and control the disease as knowledge confusion and behavioral practice may affect the control measures (Klein *et al*, 1995) [15] (Safari *et al*, 2010) [26]. Studies about knowledge, attitude and practices (KAP) showed that direct interaction with community plays an important role in diminishing malaria problem (Collins KA,*et al*,1997) [3], Singh Neeru,*et al*,1998) [28].

Although numerous studies to assess the level of malaria knowledge and behavioral practice have been done in different regions of the world. to the best of our knowledge, no studies have been reported in the Hail region of Saudi Arabia. Therefore, the objective of the current study was to detect the level of awareness of malaria among Hail population to enhance awareness about malaria so as they can face any expected malaria infection in the future. The study findings also may provide baseline data that could be used for evaluating the effectiveness of strategies following implementation of malaria control programs.

Material & Methods

1. Setting

The current study was conducted in Hail city, which is located in north of Saudi Arabia, and found at distance of 690 km from Riyadh, the capital city of Saudi Arabia during the year 2016-2017.

2- Sampling

A total of 1300 participants agreed to participate in the current study. Samples were randomly chosen from urban and rural districts

3-Data Collection

Data were collected through individual interviews to fill A structured questionnaire including information regarding:

1. Socio-demographics: Age, residence, educational and occupational status … etc.
2. General knowledge about malaria regarding source of information, mode of transmission, symptoms
3. Behavioral practice of the participants regarding the preventive measures that should be considered as recommended by Centers for Disease Control and Prevention (World Health Organization, 2008) [32]. The question formats included mixture of yes/no (closed ended) and open ended questions.

At the end of the interview participants were inquired about their sources of information.

Pilot Testing

Initial questionnaire was compiled in English, which was translated into Arabic and then tested on a small sample of Saudi persons. From the results of the pilot testing malaria is known among Saudi individuals as "Raash", so, the previous term was used all through the interview.

Data analysis

All data collected were analyzed and expressed as percentage distribution

Ethical Considerations

Full orientation of the approached participants about the study purposes was carried out with the emphasis on their right of not to participate. An individual verbal consent to participate and fill the questionnaire was taken from each participant and data confidentiality was maintained all though.

Results

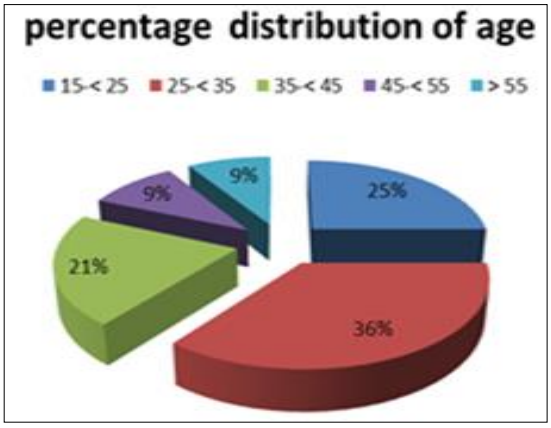


Table 1: Percentage distribution of age as one of the sociodemographic profile among Hail population, Saudi Arabia (2016-2017)

Age in years	Age distribution	
	No	%
15-< 25	325	25
25-< 35	463	36
35-< 45	272	21
45-< 55	124	9
> 55	116	9
Total	1300	100%

Table 2: Percentage distribution of educational level as one of the sociodemographic profile among Hail population, Saudi Arabia (2016-2017)

Education level	Educational distribution	
	No	%
Illiterate	194	15
Primary school	165	13
Preparatory school	196	15
Secondary school	268	20
High education	477	37
Total	1300	100%

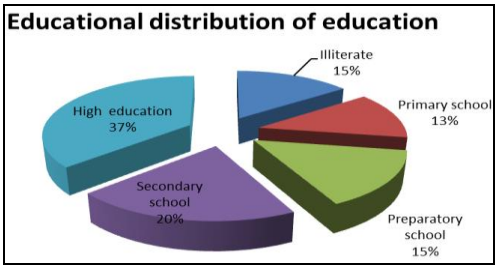


Table 3: Percentage distribution of occupation as one of the sociodemographic profile among Hail population, Saudi Arabia (2016-2017)

Occupation	Occupational status	
	No	%
Students	386	30
Working	681	52
Not working	233	18
Total	1300	100%

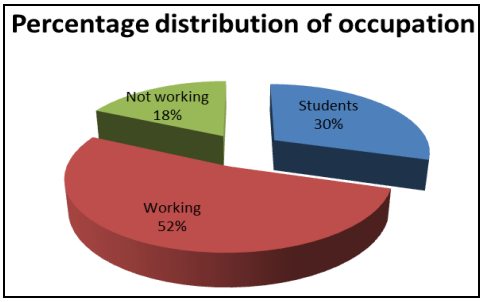


Table 4: Percentage distribution of residency as one of the sociodemographic profile among Hail population, Saudi Arabia (2016-2017)

Residency	Residency distribution	
	No	%
House	689	53
Flat	611	47
Total	1300	100%

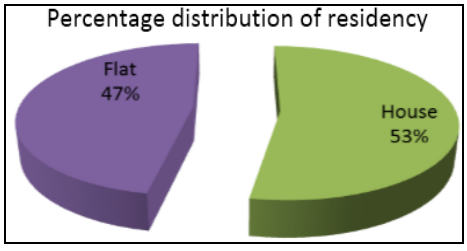


Table 5: Percentage distribution of marital status as one of the sociodemographic profile among Hail population, Saudi Arabia (2016-2017)

Marital status	Marital status distribution	
	No	%
Married	697	53.6
Non married	603	46.4
Total	1300	100%

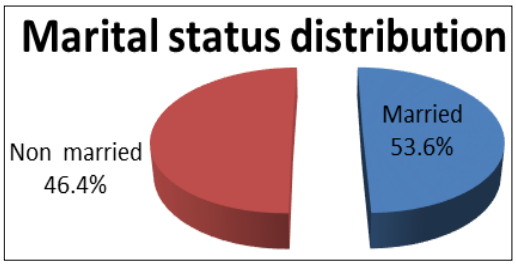


Table 6: General knowledge about malaria among Hail population, Saudi Arabia (2016-2017)

Knowledge about	Participants having knowledge		participants lacking knowledge		Total
	No.	%	No.	%	
Definition of malaria (hearing or reading about it)	872	67.0	428	33	1300(100%)
Malaria is a deadly disease	653	50.2	647	49.8	
Malaria is a communicable disease	431	33.1	869	66.9	
The correct causative agent ; being a protozoa	88	7	1212	93	
Treatment availability	321	25	979	75	
Malaria is treated by tablets	281	21.6	1019	78.4	
Malaria is treated by injections	312	24.0	988	76.0	
Malaria is treated by herbal preparations	889	68	411	32	
Importance of finishing treatment	203	15.6	1097	84.4	
interrupting malaria treatment may lead to death	169	13	1131	87.0	
Overdose of anti-malarial drugs may be lethal	102	7.8	1198	92.2	
There is resistance developed toward anti-malarial drugs	85	6.5	1215	93.5	
Malaria is a preventable disease	234	18	1066	82	
Wearing protective clothes protect from malaria (trousers, full sleeve shirts)	192	14.7	1108	85.3	
the activity time of mosquito, (which usually between sunset and dawn).	127	9.7	1173	90.3	
Using skin repellant can protect from malaria	104	8.0	1196	92	
Areas endemic in malaria	98	7.5	1202	92.5	
Precaution and prophylactic tablets when visiting endemic areas	71	5.5	1229	94.5	

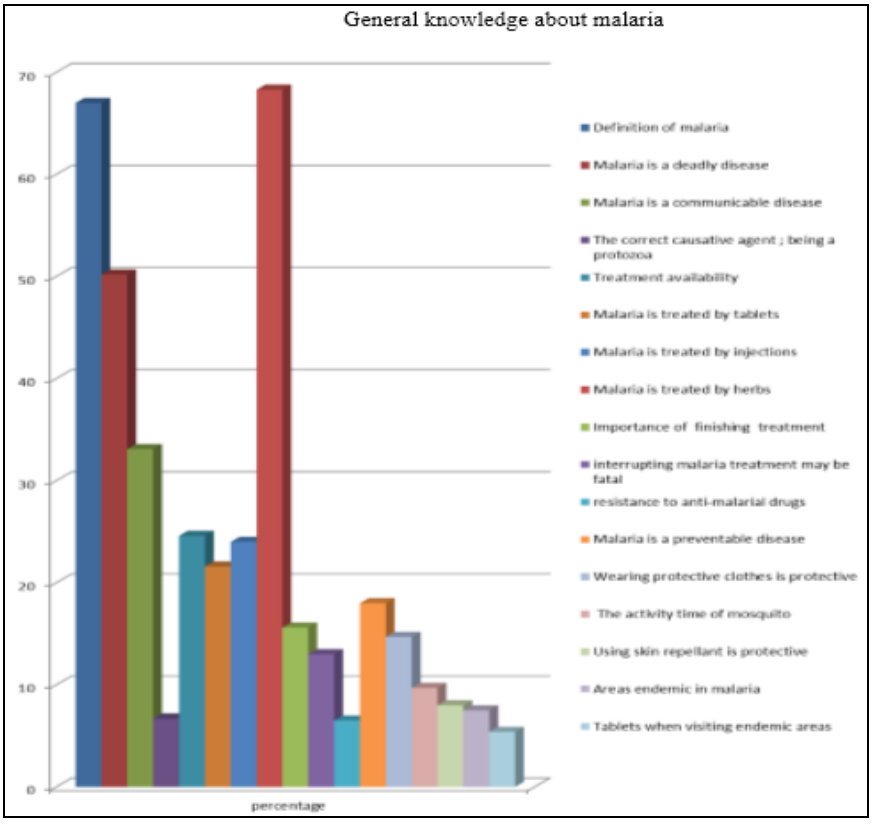


Table 7: Source of information about malaria among Hail population, Saudi Arabia (2016-2017)

Source of knowledge	Participants having knowledge		Total
	No.	%	
Television	334	25.6	
Newspaper	82	6.3	
University or school	140	10.7	**1300**
Internet	1016	78	
Health worker	77	5.9	
Friends and relatives	703	54	
Books	18	1.4	

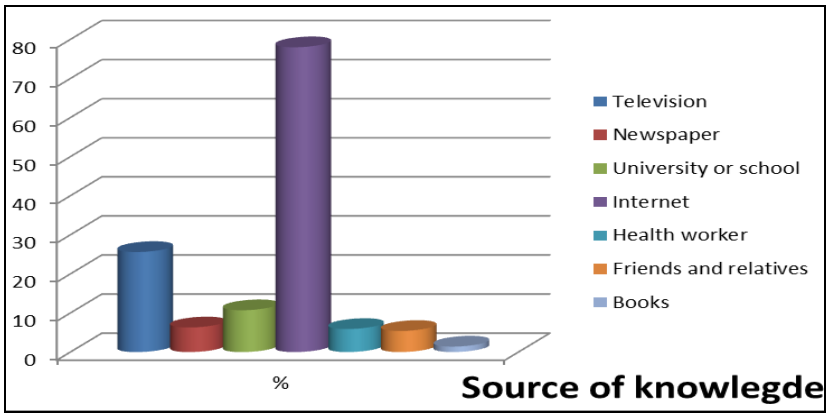


Table 8: Awareness (knowledge) about the mode of transmission of malaria among Hail population, Saudi Arabia (2016-2017)

knowledge about	Participants gave the answer Yes		Participants gave the answer No		Total
	No.	%	No.	%	
Mosquito bites	862	66.3	438	33.7	1300(100%)
Flies bite	679	52.2	621	47.8	
Sneezing or coughing from infected person	561	43.1	739	56.9	
Consumption of raw or inadequately cooked meat (Salami, Pastrami, luncheon, sausages, burgers, minced meats)	438	33.6	862	66.4	
Consumption of unwashed vegetables and fruits	582	44.7	718	55.3	
Blood Transfusion	249	19.1	1051	80.9	
Does standing water facilitate transmission	429	33.0	871	67.0	
Can physical contact transmit malaria	763	58.6	537	41.4	

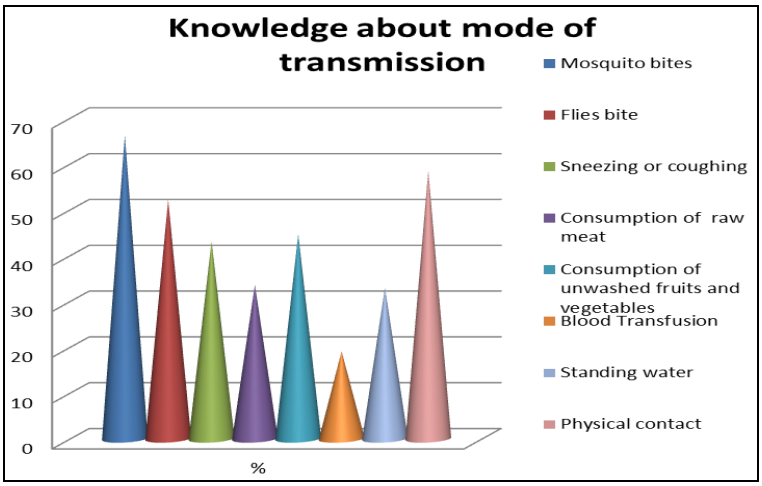


Table 9: Awareness (knowledge) about the clinical manifestations of malaria among Hail population, Saudi Arabia (2016-2017)

Knowledge	Participants gave the answer Yes		Participants gave the answer No		Total
	No.	%	No.	%	
Regular fever	342	26.3	958	73.7	1300(100%)
Irregular fever	276	21.2	1024	78.8	
Headache	550	42.3	750	57.7	
Coldness	435	33.5	865	66.5	
Shivering	365	28.0	935	72.0	
Jaundice	681	52	619	48	
Weakness	765	59	535	41	
Vomiting	123	9	1177	91	
Diarrhea	567	43.6	733	56.4	
Constipation	334	26	966	74	
Eczema	67	5.1	1233	94.9	
Gastric pain	204	15.6	1096	84.4	

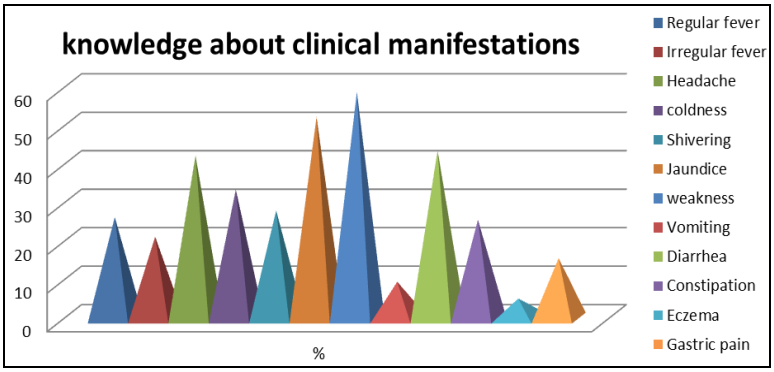


Table 10-a: Behavioral own practice (risk behaviors) towards the preventive measures against malaria among Hail population, Saudi Arabia (2016-2017)

practice towards preventive measures	participants with +ve practice		participants with -ve practice		Total
	No	%	No	%	
Personal precautions measures (trousers, full-sleeve shirts at the activity time of mosquito, which usually between sunset and dawn).	337	25.9	963	74.1	1300(100%)
Mosquito bed-nets available at home	143	11.0	1157	89.0	
Is it annoying to use bed nets	649	49.9	651	50.1	
Does the presence of mosquitoes bother you	912	70.1	388	29.9	
Anti-mosquito spray inside home	652	50.1	648	49.9	
Nets on windows Indoor	719	55.3	581	44.7	
Always closed doors	837	64.3	463	35.7	
Using skin repellant	123	9.46	1177	90.5	
Washing vegetable	852	65.5	448	34.5	
Well cooking of meat	698	53.69	602	46.3	
Wearing masks	712	54.76	588	45.2	
Avoid contacts with cats and dogs	766	58.92	534	41.1	

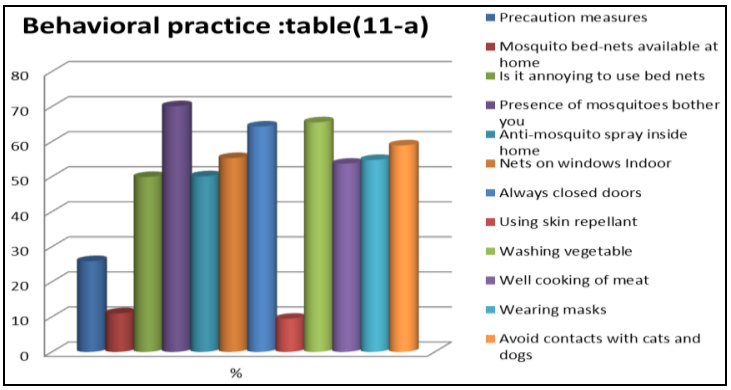


Table 10-b: Behavioral own practice (risk behaviors) towards the preventive measures against malaria among people living in houses Hail population, Saudi Arabia (2016-2017)

practice towards preventive measures	participants with +ve practice		participants with -ve practice		Total
	No	%	No	%	
residual spraying outside home	179	26	510	74	689 (100%)
Cut grass and trees regularly	124	18	565	82	
Monitor stagnant water regularly	378	56	311	44	

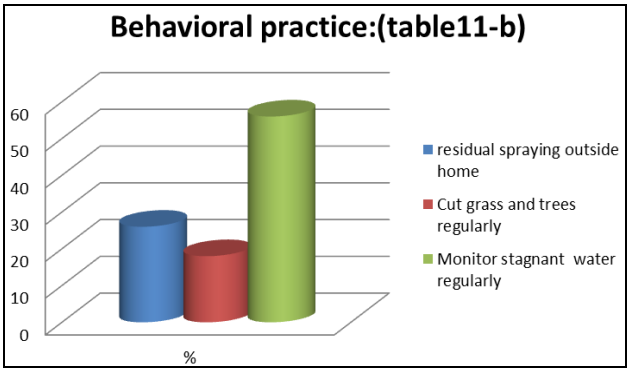
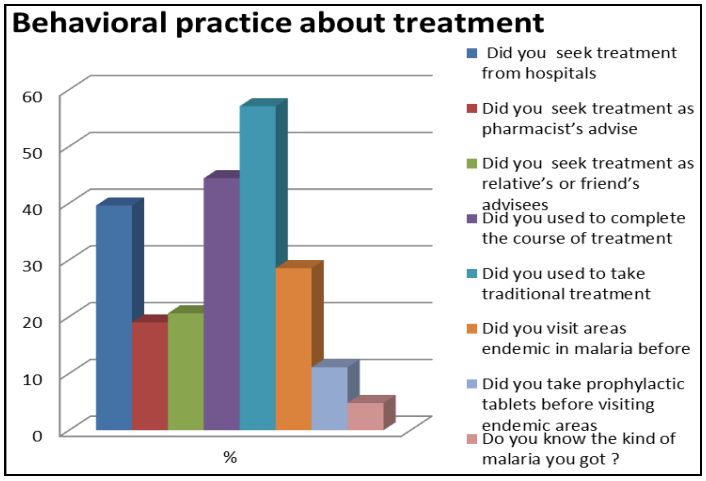


Table 11: Behavioral Practice about the treatment when getting malaria in Hail Region, Saudi Arabia (2016-2017)

Behavioral Practice	participants having +ve practice	
	No	%
Did you seek treatment from hospitals	25	39.6
Did you seek treatment as pharmacist's advise	12	19.0
Did you seek treatment as relative's or friend's advisees	13	20.6
Did you used to complete the course of treatment	28	44.4
Did you used to take traditional treatment	36	57.1
Did you visit areas endemic in malaria before	18	28.57
Did you take prophylactic tablets before visiting endemic areas	7	11.1
Do you know the kind of malaria you got?	3	4.8
Total participants getting malaria in the past	63	100%



Discussion

To the best of our knowledge, this is the first cross-sectional study about the knowledge and the behavioral practices regarding malaria in Hail region, Saudi Arabia. This data could be considered as a baseline data to evaluate and to conduct control measures for malaria in the Hail region and or similar areas. Although most of the participants (67.0%) reported they were aware about malaria, however, their depth of knowledge was poor as only few participants had sufficient information about the causative agent (7%), prophylaxis (5.5%) and treatment of malaria (25%). Unexpectedly, 68.0% of the respondents thought wrongly that malaria is treated by herbal preparation. This could be contributed to the deep traditional thought and belief of Hail population in the herbal treatment for most of the diseases. On the other hands a comparatively higher awareness was detected among Ghana population which could be explained on the fact that malaria is an important health problem and has a greater disease

prevalence in Ghana, as in many other countries in Africa (Kimbi *et al*, 2014; Yimer *et al*, 2015; Erhun *et al*, 2006 & Mazigo *et al*, 2010) [14, 36, 9, 19]

The results of the current study showed that more than half of the respondents (50.2%) believed that malaria is a fatal disease. Similar studies in south-western Saudi Arabia as well as in Nepal also reported that the majority of participants believed that malaria was a fatal disease (Sami *et al*, 2016) [27] & Joshi & Banjara, 2008) [13]. approximately 75.4 % of the participants in the present study thought that it was not a treatable disease and 82% of them believed that malaria is preventable. These findings go hands in hands with a previous study done in southwest of Saudi Arabia (Sami *et al*, 2016) [27]. The deficient in knowledge detected in the current study may be due to the relatively high frequency of illiteracy among participants or because of malaria is uncommon disease in the Hail area. Thus malaria awareness programs should be developed and implemented to educate and increase the public awareness towards the disease. (Sami *et al*, 2016) [27]

As expected, the main source of information was the internet and social media (78%). The friends, relatives, health workers, university, schools, television and newspapers were less. Books as source of information were the least source (1.4%). These results are in contrast to the study conducted in Swaziland in 2009 that indicated healthcare workers as the main source of information about malaria (Hlongwana *et al*, 2009) [11]. The result of the current study could be explained on the basis that there is a great effect internet and social media on public health. However, there is a well-known risks that the public get their information from the internet and social media, but there is a fact that it is the most common available and accessible source of information The majority of the respondents)66.3***%)*** mentioned that

mosquito bite was a possible cause of malaria, and transmission occurs from person-to-person through mosquito bite. This awareness is higher than the level reported in other parts of Ethiopia (Legesse M & Deressa TT, 2009 [17, 5]; Deressa W *et al*, 2003 [4]; Legesse Y *et al*,2007 [16].

Although majority of the respondents associated the cause of malaria with mosquito bite, 52.2%, 43.1 %, 33.6 %, 44.7%, 58.6% of respondents believed wrongly that flies bites, Consumption of raw or inadequately cooked meat,sneezing or coughing, Consumption of unwashed vegetables and fruits, and physical contact can transmit malaria. respectively. Such misunderstandings have also been reported by other studies (Legesse M & Deressa, 2009 [17, 5]; Legesse Y *et al*, 2007 [16] & Safari *et al*, 2010 [26]. Although the belief of the community in wrong modes of transmission seem incorrect, the idea may indicate the occurrence of other related traditional or other factors that could be risk factors for malaria. Consequently, this wrong believes should be corrected with health education programs which could change population knowledge and behavioral practice. On the other hands, studies have reported better understanding of the causes of malaria in communities who had better awareness about the issue through health education (Adedotun *et al*, 2010 [1] & Dickson *et al*, 2011) [6].

In the current work, unfortunately knowledge about clinical manifestation was very deficient as demonstrated that 26.3% of contributors only knew that malaria cause regular fever whereas, 42.3%, 33.46% and 28.0% knew that malaria cause headache, coldness and shivering respectively. Surprisingly 28.2 % of respondents thought wrongly that malaria can cause eczema. In South western Saudi study (Sami *et al*, 2016) [27], fever was reported as the most common symptom of the disease, followed by pain, vomiting, feeling cold and weakness. This finding is consistent with findings in other studies (Hlongwana *et al*, 2009 ; Dunyo *et al*, 2000 & Dressa *et al*, 2003 & Nuwaha F,2002) [11, 8, 4, 21]

The results of the present study indicate that studies on behavioral practices related to malaria prevention and treatment is not sufficient in Hail region, Saudi Arabia. This may be possibly due to low incidence of malaria in the region compared with other more common diseases such as diabetes, cardiovascular and obesity among other diseases. Unfortunately, only 39.6% of participants sought treatment for malaria from hospitals or health facilities, 19% from pharmacists and 20% from relatives and friends' advices. 57.1 % however sought traditional treatment.The findings of our study are similar with findings from other regions in sub-Saharan Africa, where the first-line of treatment is sought from non-official sources (Dunyo *et al*,2000 ; & Dressa *et al*, 2003 & Nuwaha F,2002) [8, 4, 21]. Similar to our findings was a study conducted in Nepal showed that participants consulted traditional treatment suggesting a lack of health facilities and lack of knowledge in that areas (Joshi & Banjara, 2008 [13]. Contrasting to the results of the present work, almost all participants (97.5%) of the South Western Saudi study sought treatment for malaria from healthcare facilities, with more than half seeking treatment within 24 h of presenting with symptoms. (Sami *et al*, 2016 [27]. Another opposing results to the current study, were demonstrated in southern Ghana (Dunyo *et al*, 2000) [8] The high percentage of respondents seeking treatment at healthcare facilities, suggesting a good availability of health services and accessibility of healthcare facilities in the study region. Unfortunately very few percentages of respondents used to take prophylactic tablets before visiting endemic areas (11 %) and only (4.8 %) knew the kind of malaria they have got. This date indicated the very low level of healthy behavioral practice and the needs for health education programs specially for prophylaxis against malaria

As regards personal prophylactic measures practiced by participants in the present study, 50.1% of people used to spray the anti-mosquito sprays and unfortunately, only 11% of the current study participants reported that they have mosquito nets in their houses. These proportions are much 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 (Hlongwana *et al*, 2009) [11]. Furthermore, more than half of participants in the present work (55.3%), reported using wire nets on windows while much less percentage was detected among southern region of Saudis (29.8%). Moreover this measure was adopted by only 9.3% of participants in a study conducted in Iran (Hanafi-Bojd AA, *et al* 2011) [10].

In the present work, only 9.46 % of the participants used to rub with skin repellant. On the contrarily, in the western Saudi study, more than half of the respondents reported that their houses were not use it. Similar findings to that of western

Saudi was reported in Nepal (Joshi & Banjara, 2008 [13]. Our results unfortunately are very far from WHO guidelines, which recommend that more than 80.0% of households within targeted communities should sprayed against mosquitoes (WHO,2006) [16]. Surprisingly, in the current work, more than half, 65.5%, 53.69%, 54.76% and 58.92% of the respondents strictly practiced washing vegetable, well cooking of meat, wearing masks and avoid contacts with cats and dogs as wrong knowledge that those behaviors would prevent infection with malaria

Conclusion

The current study proved that Hail population have low level of knowledge as well as they are lacking the necessary preventive behavior to malaria infection. However, most of the preventive behaviors that are applied could be explained by the economic, and cultural habits in the region. Furthermore, the physicians should be at the first line to educate people about mode of transmission. Moreover, the current study could put a baseline information regarding knowledge and behavioral practice related to malaria disease.

Recommendation:

1-Although this study, included 1300 participants, this sample is not considered enough to represent the whole Hail community, so in the future, it should extend to cover more areas of Hail region specially the remote villages.

2-Constructing a new project to study the comparative relationship between sociodemographic data, knowledge and risk behaviors for malaria disease.

3-Constructing a further study to assess the effect of risk behaviors through blood analysis to detect seropositivity against Malaria as well as to get the prevalence of the disease in the region.

4-An appropriate health education program has to be adopted so as to educate people in groups like in schools, hospitals and other work areas about malaria.

Limitation of the Study

To our knowledge, this is the first study that explores malaria related knowledge and risk behaviors among Hail population, Saudi Arabia. Most of the study limitations are due to the shortage of the time of the study. Nevertheless, the results of the current study should be cautiously interpreted in the lights of the following limitations:

1-The study population might have been increased to be more accurately representative of all Hail region Saudi Arabia.

2-Comparative relationship between sociodemographic data, knowledge and risk behaviors might have been better to fulfilled.

3-The effect of risk and preventive behavior was not assessed through blood analysis to detect antibodies against malaria.

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