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Original Research Article.

Knowledge and Practice of Secondary School Students Toward Malaria Prevention and Control in Baish City, Saudi Arabia

Ibrahim Ghalib Bahri[1*], Mohammad Hakamy[1], Eisa Ghazwani[2]

[1]Family Medicine Department, General Directorate of Health Affairs, Jazan, KSA.
[2]Public Health Department, General Directorate of Health Affairs, Aseer, KSA.

ABSTRACT

Background: Malaria has been documented since 1941 as a major health problem in Saudi Arabia. The majority of malaria cases were of the malignant type caused by *P. falciparum.* The group of patients who were more than 14 years old showed a significantly higher number of patients than the other four age groups.

Objectives: Assess the level of knowledge and practice of secondary school students in Baish city regarding prevention and control of malaria.

Subjects and Methods: A cross sectional study was conducted included a representative sample of secondary school students in Baish City, KSA. Primary health care physicians working in the PHC centers of the ministry of health in Jeddah. A self-administered questionnaire in simple Arabic Language was developed by the researcher including personal characteristics, knowledge about malaria: these are 24 statements toward which the students responded by: "agree", "do not agree", or "I am not sure" and practice: these are 6 statements toward which the students responded by: "yes", "no", or "sometimes". Responding correctly for at least 50% of the statements was considered satisfactory regarding malarias' knowledge, practice and overall scores.

Results: Out of 1100 students invited to participate in the study, 997 of them returned completed questionnaire. Thus, the response rate was 997/1100=90.6%. Their age ranged between 15 and 26 years with a mean of 17.3 years and standard deviation of 1.3 years. More than half of them were males (58.7%). Almost two- thirds of them (68.4%) were in the division of science while only 7.8% were in the division of Literature. Sixty-two students (6.2%) reported a history of malaria. Unsatisfactory knowledge about malaria was reported among 76.1% of students. Unsatisfactory practice regarding malaria control was reported among 45.3% of students. Older, female and science division students were more knowledgeable in addition to those studying malaria and have family history of malaria.

Conclusion: The findings of this study indicate that the knowledge about clinical features, mechanism of spread and prevention measures was less than expected among secondary students of endemic area of Saudi Arabia. In addition, Preventive measures in an endemic area are less than recommended. Organization of malaria awareness campaigns in secondary schools particularly in endemic areas is highly recommended.

Keywords: Knowledge, Practice, Malaria, Control, Saudi Arabia.

***Correspondence to:**

Dr. Ibrahim Ghalib Bahri, SBFM,
Consultant family medicine,
Family medicine department,
General Directorate of Health Affairs, Jazan, KSA.

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INTRODUCTION

In this new millennium, parasitic diseases are still causing death, suffering, financial burden and enormous lost labor time in most developing countries.[1] The human and economic costs associated with declining quality of life, consultations, treatments, hospitalizations and other events related to malaria are enormous and often lead to low productivity and lost incomes. Experiences with malaria have shown that prevention is better and cheaper than cure; however the practice of malaria preventive measures has been related to the knowledge and belief of people and have been found to be low and difficult to implement when malaria risk is perceived to be low.[2]

Malaria remains a major problem in many parts of the world. Approximately 500 million people are affected each year. About three million die of falciparum malaria each year. Despite a vigorous program of malaria control in the Kingdom of Saudi Arabia, it is still endemic in the southwestern area of the country. As a result of continued preventive measures, the epidemiology of the disease may be changing.[3]

The magnitude of the public health burden posed by malaria worldwide and its connection to poverty has motivated the international community toward financing for malaria endemic countries.[4] Recent evidence indicates a precipitous increase in

access to effective drugs and prevention strategies in several countries.[5] In part, this renaissance in malaria control has served as a catalyst to revisit the possibility of malaria elimination in many regions and countries.[6]

Malaria has been documented since 1941 as a major health problem in Saudi Arabia.[7] The majority of malaria cases were of the malignant type caused by *P. falciparum,* although *P. vivax* and *P. malariae* were also present.[1] The group of patients who were more than 14 years old showed a significantly higher number of patients than the other four age groups.[8]

This study aimed to assess the level of knowledge and practices of secondary school students in Baish City, Saudi Arabia regarding malaria.

SUBJECTS AND METHODS

A cross-sectional study was carried out Jizan Region, which lies in the southwest of Kingdom of Saudi Arabia (KSA). It occupies an area of 16,000 km^2, where 455 villages are scattered. The topography of the area consists of mountains in the east that are extensions of Al-Sarawat Mountains, the valley that extends from north to south and contains some streams of water running from east to west, and a hilly area that lies between the mountains in the east and the Red Sea coast in the west and gradually slopes toward the west. The climate is subtropical, being hot during summer with a range of temperature between 30º and 40ºC, while in winter it is warm with a mean temperature of 25ºC in January. The relative humidity is high and usually between 50 and 70%, sometimes reaching 90%. Rain falls all year round. An irrigation system consisting of basins is used to collect rain water during the months of July and August for use in agriculture.[1]

Baish is a city, having almost all essential facilities and governmental departments. Its area is about 300 km2. It serves about 30 small villages around. Baish has a population of about 20,000 persons. It contains supervision department of female education for about one third of Jizan area. It has one general hospital, one primary health care center.[9]

The study population was all secondary school students in Baish City (10 secondary schools for boys and 9 secondary schools for girls). The number of registered students in each school is about 300 students.

The number of students that included in the present study has been determined according to Bartlett et al.[31], as follows:

$$n_o = \frac{(t)^2 \, X \, (p)(q)}{d^2}$$

where:

- no: Calculated minimum sample size.
- t: value for selected alpha level of .025 in each tail = 1.96.
- (p)(q): estimate of variance = 0.25.
- d: acceptable margin of error for proportion being estimated = 0.05 (error researcher is willing to except).

$$n_o = \frac{(1.96)^2 \, X \, 0.25}{(0.03)^2} = 1067$$

The researcher used the table of random numbers to select four secondary schools (two for boys and two for girls). In the selected school, the questionnaires were distributed to all students in the selected schools, to fulfill the required sample size, i.e., about 1100 students.

Based on relevant literature review, the researcher developed a self-administered study questionnaire in simple Arabic Language that included the following:

1. Personal characteristics: school, student's age, gender, scholastic year, type of study (Literature or Science), being infected with malaria, family history of malaria infection.
2. Knowledge about malaria: these are 24 statements toward which the students responded by: "agree", "do not agree", or "I am not sure".
3. Practice: these are 6 statements toward which the students responded by: "yes", "no", or "sometimes".

A score of (1) was assigned to a correct response (whether knowledge or practice) and a score of (0) was assigned to an incorrect response (or not sure for knowledge or sometimes for practice). So, the maximum score was 24 for knowledge (if the student responds correctly to all 24 knowledge statements), and 6 for practice (if the student responds correctly to all 6 practice statements). Consequently, the maximum total score was 30.

Responding correctly for at least 50% of the statements was considered satisfactory regarding malarias' knowledge, practice and overall scores. While responding correctly for less than 50% of the statements were considered unsatisfactory regarding malarias' knowledge, practice and overall scores.

The researcher personally collected the data from boys. Two Saudi nurses helped in data collection from girls. To avoid data collector bias, the researcher trained them on proper data collection. Within each class, the data collector distributed the study questionnaire to all students and supervised them and replied to any of their inquiries. The data collector then received the fulfilled questionnaires and revised them to make sure that there are no missing data.

Collected data were verified and coded prior to computerized data entry. The researcher utilized the Statistical Package for Social Sciences (SPSS version 22.0) for data entry and analysis. Percentages mean and SD were used as descriptive statistics. Bivariate analyses of mean scores with regard to independent variables were done by student`s t-test for comparison of two groups and ANOVA test for comparison of more than two groups. Least significance difference test (LSD) test was used for post hoc comparisons of ANOVA. A p-value of less than 0.05 was adopted for statistical significance.

RESULTS

Out of 1100 students invited to participate in the study, 997 of them returned completed questionnaire (653 boys and 447 girls). Thus, the response rate of boys was 585/653=89.6% while for girls it was 412/447=92.2%. The overall response rate is 997/1100=90.6%.

The study included 997 students. Their age ranged between 15 and 26 years with a mean of 17.3 years and standard deviation of 1.3 years. More than half of them were males (58.7%) and the rest (41.3%) were females. Almost two-thirds of them (68.4%) were in the division of science while only 7.8% were in the division of Literature. More than one third of them were in the first scholastic year (39.5) or in the third scholastic year (36.6%).

Sixty two students (6.2%) reported a history of malaria while 157 (15.7%) were not sure of malaria infection. Among those reported a history of malaria, 47 (75.8%) reported only one attack while 15 students (24.2%) reported a history of more than one attack of

malaria. Family history of malaria was reported by 14.8% of the participated students.

Slightly more than one-third of the participants (37.5%) reported that they have studied malaria at school while more than half of the students (54.2%) reported that they have studied mosquitoes at schools.

Table 1: Students' knowledge about malaria (n=997).

STATEMENTS	Correct knowledge	
	No.	%
ETIOLOGY AND MODE OF TRANSMISSION		
The causative agent of malaria is a kind of bacteria **(False)**	119	11.9
The source of malaria infection is the patient **(True)**	486	48.7
All types of mosquitoes could transmit malaria **(False)**	254	25.5
Infected animals could transmit infection to humans **(False)**	184	18.5
Transplacental transmission of malaria is possible **(True)**	490	49.1
Blood transfusion could transmit malaria infection **(True)**	612	61.4
Smoking could transmit malaria infection **(False)**	421	42.2
Contaminated food could transmit malaria infection **(False)**	150	15.0
Droplet transmission is possible in malaria **(False)**	88	8.8
MALARIA SYMPTOMS, SIGNS AND COMPLICATIONS		
Malaria patient complains of fever and shivering **(True)**	85	58.7
Malaria leads to splenomegaly **(True)**	230	23.1
Malaria leads to hepatomegaly **(True)**	138	13.8
Malaria leads to destruction of red blood cells **(True)**	278	27.9
Malaria leads to anaemia **(True)**	321	32.2
Some type of malaria could lead to death of the patient **(True)**	553	55.5
MALARIA LIFE CYCLE, EPIDEMIOLOGY AND CONTROL		
Mosquitoes reproduce in stagnant water collections **(True)**	705	70.7
The most prevalent area for malaria in KSA is Jizan **(True)**	458	45.9
KSA has a plan to eradicate malaria in the next ten years **(True)**	405	40.6
Malaria could be eradicated through mosquito control and treatment of patients **(True)**	650	65.2
Mosquitoes could reproduce over red sea **(False)**	225	22.6
Mosquitoes reproduce mainly during summer **(True)**	307	30.8
Mosquitoes suck human blood mostly at night **(True)**	727	72.9
Some kinds of fish feed on mosquitoes larva **(True)**	297	29.8
Covering water collections with some kinds of oil kills mosquitoes larva **(True)**	304	30.5

Table 2: Students' practice of malaria control measures (n=997).

STATEMENTS	Correct knowledge	
	No.	%
Use of mosquito bed net **(True)**	299	30.0
Putting mosquitoes `screen on house windows **(True)**	461	46.2
Insecticides use **(True)**	564	56.6
Use of chemical substances that control mosquitoes in endemic areas **(True)**	552	55.4
Periodic laboratory check-up to confirm absence of malaria **(True)**	263	26.4
Sleeping in outdoor while it is suitable **(False)**	467	46.8

KNOWLEDGE OF MALARIA

Etiology and Mode of Transmission: As shown in table I, only 11.9% of secondary school students in Baish responded correctly that causative agent for malaria is not a kind of bacteria. Almost one quarter of them (25.5%) knew that not all types of mosquitoes could transmit malaria while 18.5% of them reported correctly that infected animals could not transmit malaria infection to humans. Approximately half of them (48.7%) reported that the source of infection is the patient (48.7% and 49.1% stated that transplacental transmission of malaria is possible. Six-hundreds and twelve students (61.4%) answered that blood transfusion could transmit malaria infection. Contrary to that only 42.2%, 15% and 8.8% of the students reported correctly that smoking, contaminated food and droplet transmission are not modes for malaria transmission, respectively.

Malaria Symptoms, Signs and Complications: As illustrated in table I, more than half of the students (58.7%) knew correctly that malaria patient presents with fever and shivering and some types of malaria could be fatal (55.5%). Almost one- third of them (32.2%) recognized that malaria leads to anaemia, while only 23.1% and 13.8% knew that malaria leads to splenomegaly and hepatomegaly, respectively. More than one-quarter of students

(27.9%) reported correctly that malaria leads to destruction of the red blood cells.

Malaria Life Cycle, Epidemiology and Control: Table I shows that most of the students (70.7%) reported correctly that mosquitoes reproduce in stagnant water collections (70.7%) and mosquitoes suck human blood mostly at night (72.9%). Almost two-thirds of the students (56.2%) reported that malaria could be eradicated through mosquitoes control and treatment of patients. Less than half of them (45.9%) knew that the most prevalent area for malaria in KSA is Jizan and that KSA has a plan to eradicate malaria in the next ten years (40.6%). Less than one-third of the participants (30.8%) reported that mosquitoes reproduce mainly during summer, covering water collections with some kinds of oil kills mosquitoes larva (30.5%) and some kinds of fish feed on mosquitoes larva (29.8%). Only 22.6% of the students answered correctly that mosquitoes could not reproduce over red sea.

Table 3: Factors associated with Malaria knowledge among students (range 0-24).

	Mean	SD	p-value
DEMOGRAPHIC CHARACTERISTICS			
Age in years			
≤17 (n=596)	8.5	3.6	
>17 (n=401)	9.7	3.8	<0.001**
Gender			
Males (n=585)	8.8	3.9	
Females (n=412)	9.6	3.4	0.049*
Type of the study			
General (n=237)	7.9	3.5	
Science (n=682)	9.3	3.8	
Literature (n=78)	7.7	2.8	<0.001*
Scholastic year			
First (n=394)	7.9	3.7	
Second ((238)	8.8	3.7	
Third (365)	10.3	3.4	<0.001*
MALARIA HISTORY			
Personal history of malaria			
No (n=778)	8.9	3.9	
Yes (n=62)	9.9	3.1	
Not sure (157)	9.2	3.2	0.156*
Family history of malaria			
No (n=850)	8.8	3.8	
Yes (n=147)	10.2	3.2	<0.001**
HISTORY OF MALARIA STUDY			
Study of malaria			
No (n=623)	8.4	3.5	
Yes (n=374)	10.1	3.8	<0.001
Study of mosquitoes			
No (n=457)	8.3	3.7	
Yes (n=540)	9.6	3.6	<0.001

***ANOVA test; **student`s t-test**

PRACTICE OF MALARIA CONTROL MEASURES

Table 2 shows that more than half of the students (56.6%) reported that they use insecticides and chemical substances (55.4%) to control mosquitoes in endemic areas. Less than half of them (46.2%) reported putting mosquitoes` screen on windows and avoid sleeping in outdoor even it is suitable (46.8%). Only 30% reported using of mosquito bed net and 26.4% performed laboratory periodic laboratory check-up to exclude malaria.

Factors associated with malaria knowledge: It is clear from figure 1 that unsatisfactory knowledge about malaria was reported among 76.1% of students.

As shown in table 3, older student (>17 years) had higher significant knowledge about malaria than those 17 years old or younger (mean knowledge scores were 9.7±3.8 versus 8.5±3.6, p<0.001). Females had higher significant knowledge about malaria than males (mean knowledge scores were 9.6±3.4 versus 8.8±3.9, p=0.049).

Students in the science division had significant higher knowledge about malaria than those in the general or literature divisions (mean knowledge scores were 9.3±3.8 versus 7.9±3.3 and 7.7±2.8, respectively, p<0.001). Students in the third scholastic year had significant higher knowledge about malaria than those in the first or second scholastic years (mean knowledge scores were 10.3±3.4 versus 7.9±3.7 and 8.8±3.7, respectively, p<0.001). Students with family history of malaria had higher significant knowledge about malaria than those without family history of malaria (mean knowledge scores were 10.2±3.2 versus 8.8±3.8, p<0.001). Personal history of malaria was not significantly

associated with malaria knowledge among secondary school students in Baish, p>0.05. Students who reported studying malaria had higher significant knowledge about malaria than those who did not report studying malaria (mean knowledge scores were 10.1±3.8 versus 8.4±3.5, p<0.001). Students who reported studying of mosquitoes had higher significant knowledge about malaria than those who did not report studying of mosquitoes (mean knowledge scores were 9.6±3.6 versus 8.3±3.7, p<0.001).

Table 4: Malaria control practice of the students (range 0-6), according to their demographic data.

	Mean	SD	p-value
DEMOGRAPHIC CHARACTERISTICS			
Age in years			
≤17 (n=596)	2.6	1.4	
>17 (n=401)	2.6	1.4	0.815**
Gender			
Males (n=585)	2.5	1.5	
Females (n=412)	2.8	1.3	0.010**
Type of the study			
General (n=237)	2.7	1.5	
Science (n=682)	2.6	1.4	
Literature (n=78)	2.7	1.3	0.592*
Scholastic year			
First (n=394)	2.6	1.5	
Second ((238)	2.5	1.3	
Third (365)	2.7	1.4	0.160*
MALARIA HISTORY			
Personal history of malaria			
No (n=778)	2.7	1.4	
Yes (n=62)	2.6	1.3	0.285*
Not sure (157)	2.5	1.3	
Family history of malaria			
No (n=850)	2.7	1.5	
Yes (n=147)	2.4	1.2	0.032**
MALARIA STUDY			
Study of malaria			
No (n=623)	2.5	1.5	
Yes (n=374)	2.9	1.3	<0.001
Study of mosquitoes			
No (n=457)	2.4	1.4	
Yes (n=540)	2.8	1.4	<0.001

***ANOVA test; **student`s t-test**

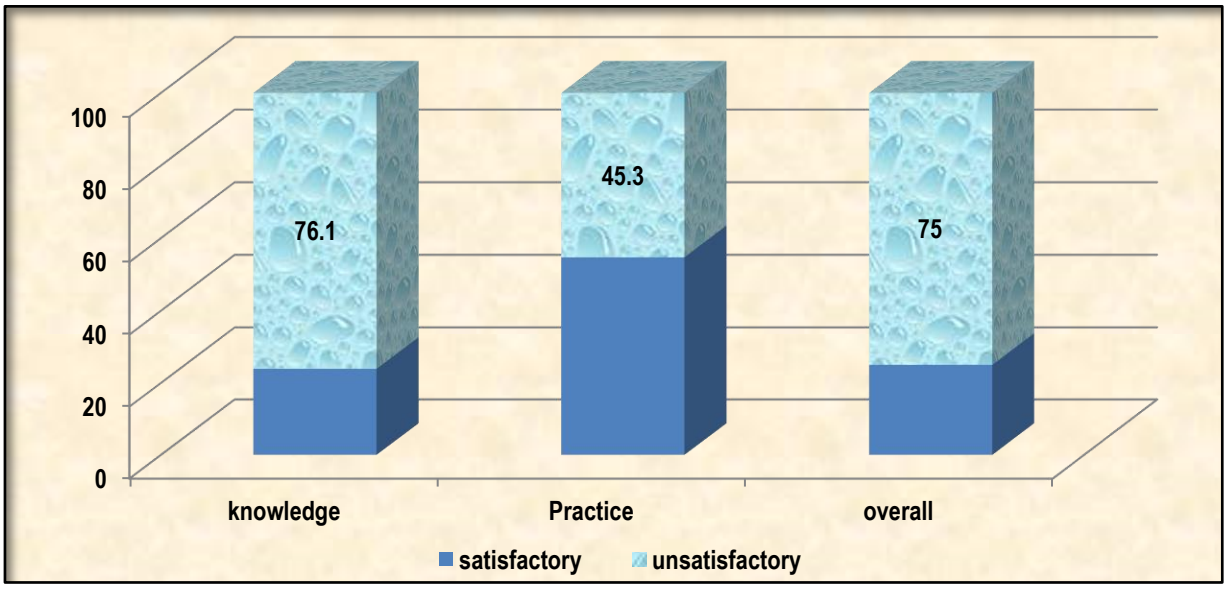

Figure 1: Malaria knowledge and practice among secondary school students, Baish.

Table 5: Malaria overall knowledge & practice score of the students (range 0-30), according to their demographic data.

	Mean	SD	p-value
DEMOGRAPHIC CHARACTERISTICS			
Age in years			
≤17 (n=596)	11.2	4.2	
>17 (n=401)	12.3	4.4	<0.001**
Gender			
Males (n=585)	11.3	4.5	
Females (n=412)	12.0	4.0	0.012**
Type of the study			
General (n=237)	10.5	4.1	
Science (n=682)	11.9	4.4	
Literature (n=78)	10.4	3.3	<0.001*
Scholastic year			
First (n=394)	10.5	4.3	
Second ((238)	11.3	4.1	
Third (365)	13.0	4.0	<0.001*
HISTORY OF MALARIA			
Personal history of malaria			
No (n=778)	11.6	4.4	
Yes (n=62)	12.4	3.8	
Not sure (157)	11.6	3.7	0.366*
Family history of malaria			
No (n=850)	11.5	4.4	
Yes (n=147)	12.6	3.6	0.001**
MALARIA STUDY			
Study of malaria			
No (n=623)	10.8	4.1	
Yes (n=374)	13.0	4.2	<0.001
Study of mosquitoes			
No (n=457)	10.7	4.4	
Yes (n=540)	12.4	4.1	<0.001

***ANOVA test; **Student`s t-test**

Factors Associated with Malaria Control Practice*:* Unsatisfactory practice regarding malaria control was reported among 45.3% of students (figure 1). Table 4 shows that females had significantly higher practice of malaria control score than males (mean practice scores is 2.8±1.3 versus 2.5±1.5, p=0.010). Students` age, type of study and scholastic year are not significantly associated with their practice of malaria control (p=0.815, 0.592, and 0.160 respectively). Students without family history of malaria had higher significant practice of malaria control score than those with family history of malaria (mean practice scores is 2.7±1.5 versus 2.4±1.2, p<0.032). Personal history of malaria is not significantly associated with practice of malaria control score among secondary school students in Baish. Students who reported studying malaria had higher significant practice of malaria control score than those who did not report studying malaria (mean practice scores is 2.9±1.3 versus 2.5±1.5, p<0.001). Students who reported studying of mosquitoes had higher significant practice of malaria control score than those who did not (mean practice score is 2.8±1.4 versus 2.4±1.4, p<0.001).

Factors Associated with Malaria Overall Score (Knowledge and Practice): As shown in figure 1, unsatisfactory overall knowledge and practice of malaria and its control was reported among 75% of students. As shown in table 5, older student (>17 years) had higher significant overall score about malaria than those 17 years old or younger (mean score is 12.3±4.4 versus 11.2±4.2, p<0.001). Females had higher significant overall score about malaria than males (mean score is 12.0±4.0 versus 11.3±4.5, p=0.012). Students in the science division had significant higher overall score about malaria than those in the general or literature divisions (mean overall score is 11.9±4.4 versus 10.5±4.1 and 10.4±3.3, respectively, p<0.001). Students in the third scholastic year had significant higher overall score about malaria than those in the first or second scholastic years (mean score is 13.0±4.0 versus 10.5±4.3 and 11.3±4.1, respectively, p<0.001). Students with family history of malaria had higher significant overall score about malaria (knowledge and practice) than those without family history of malaria with a mean score of 12.6±3.6 versus 11.5±4.4 and p=0.001. Personal history of malaria is not significantly associated with malaria overall knowledge and practice score among secondary school students in Baish (p=0.366). Students who reported studying malaria had significantly higher overall score about malaria knowledge and practice than those who did not report studying malaria (mean scores is 13.0±4.2 versus 10.8±4.1, p<0.001). Students who reported studying of mosquitoes had significantly higher overall score about malaria knowledge and practice than those who did not report studying of mosquitoes (mean scores is 12.4±4.1 versus 10.7±4.4, p<0.001).

DISCUSSION

Malaria intervention goals in endemic areas should focus on prevention of mortality and reduce morbidity as well as associated socio-economic losses. This requires the progressive creation of capacities for assessing local malaria situation and the selection of appropriate control measures. Results from surveys on knowledge, attitudes, and practices are applicable to design or improve malaria control programs, and to identify indicators for a program's effectiveness.[11]

Previous similar studies did not reveal any study conducted at national level. The present study highlights secondary school students' knowledge and practice of malaria control measures in an endemic area in KSA and shows unsatisfactory level of knowledge regarding important aspects of malaria particularly mode of transmission, consequences and control measures. This s in accordance with what observed in other reports from different parts of the world.[12-15]

The results indicate that the study population has a fair knowledge of the life cycle of malaria vectors as over 70% agreed that stagnant water could serve as breeding sites for mosquitoes. Similarly, 55.7% of the respondents were familiar with the most common symptoms associated with malaria (fever and shivering) and that some kinds of malaria could lead to death of the victim; this is expected for a population in a malaria endemic area and with formally educated population. Comparable results have been reported in Nigeria.[16] This also is in line with findings of Terekega A.[17] In a study from rural and tribal communities of south Bastar district in India, only 34.6% of respondents suspected any fever to be malaria and a meagre (8.2%) knew the drug for treatment of malaria.[18] In the present study, none of the students who had a history of malaria knew the name of the drug for treatment of malaria.

Preventive measures undertaken by the respondents are inadequate in that 56.6% of the respondents undertake any one particular preventive measure. The use of bed nets reduce the degree of human-vector contact and malaria transmission and the prevalence of malaria infection can be significantly lowered by the use of insecticide impregnated bed nets.[19,20] Thus, report shows that impact on malaria of insecticide treated nets seems good when compared with spraying trials.[21] In the current study, the use of mosquitoes'' bed nets, mosquitoes screen on house windows, fumigation and insecticides were not common in the studied community.

Although more than half of the respondents were informed about common symptoms of malaria, possibility of infection through blood transfusion and transplacental infection, there were some misconceptions about the causes of malaria, incriminating smoking and contaminated food.

The female respondents being relatively more knowledgeable about various aspects of malaria. This finding opposes that of others in India,[22] who reported that females were less knowledgeable about malaria. They arrtibuted this to their lack of exposure to communication and educational attainment which is not applicable in our community.

The type and grade of study were associated with level of knowledge about various aspects of malaria and also about practical measures to control malaria. Students of science division and of third grade were more knowledgeable in the present study. This could be attributed to the nature of their study as also those reported a history of studying malaria and/or mosquitoes at school were more knowledgeable. Sharma, et al (2007) reported that the educational status showed a distinct direct relationship with knowledge levels about various aspects of malaria after adjusting for other variables.[22] Rasania et al found in their study conducted in Delhi that literacy status was the sole predictor of knowledge about malaria.[23] However, Kaona et al reported from Zambia that there was no association between educational level and knowledge of causes of malaria.[24]

In the present work, older students were more knowledgeable about various aspects of malaria. In an Indian study conducted on a representative sample of the community,[22] age was not found to be significant predictor of knowledge but in a study in Zimbabwe, Van Geldermalsen and Munochiveyi et al[25] found that people over 50 and below 16 had significantly less knowledge. In Malawi, education and income both were found to be significant predictors of prevention practices related to malaria.[26] These findings didn't match with our study due to different population groups. However, age was a significant factor in our study.

It is disappointing that the knowledge about clinical features, mechanism of spread and prevention measures was less than expected among secondary students of endemic area of Saudi Arabia. Thus, a health education program is needed to increase the community needs for improvement of knowledge and awareness on all the various aspects associated with malaria. That is cost-effectiveness and sustainable community-based interventions can be formulated and implemented with better success and great involvement of the community members who will be aware of what exactly is at stake. Community-based interventions have been carried out in Kenya.[27]

Among limitations of the present study is that it was focused on level of knowledge and practice regarding malaria in specified community restricted to a particular type of population, namely secondary school students. It may be inferred from our results that improvement in knowledge, attitudes and practices related to malaria may be attained only after looking at its predictors at micro level.

The results of our study can be incorporated into the decision-making processes, the design of sustainable interventions with active community participation, and the implementation of educational programmes.

In conclusion, the findings of this study indicate that the knowledge about clinical features, mechanism of spread and prevention measures was less than expected among secondary students of endemic area of Saudi Arabia. In addition, Preventive measures in an endemic area are less than recommended.

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