Original Article

Zika Virus: Knowledge, Attitudes, and its Prevention Approach Among Students of the Health Colleges at Qassim University, Saudi Arabia

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Abstract:

Background: Zika virus (ZIKV), a flavivirus transmitted by Aedes species mosquitoes, was first identified in the Zika Forest in Uganda in 1947. There is a Saudi concern about Zika, and the Saudi health authority is trying to do their best to prevent any outbreak considering that people' precautions that are taken based always on their knowledge toward infectious diseases.

Aim: To assess the level of knowledge and attitudes towards Zika virus (ZIKV) and its prevention among Health Colleges' students at Qassim University (QU), Saudi Arabia. In addition, to identify factors associated with level of knowledge regarding ZIKV.

Methods: A stratified random sample of 343 students (male and female) participated in a cross-sectional study. The questionnaire consisted of 46 questions assessing the knowledge, attitudes, and prevention practices regarding ZIKV.

Results: Mean age of participants was 22 years old (SD ± 1.6) and the internet was the commonest source of information. Overall, most participants had poor knowledge regarding ZIKV (n = 274, 79.9%) and positive attitude (n= 294, 85.7%) regarding learning more about ZIKV. In terms of prevention practices, more than half of participants (n=191, 54.7%) confirmed using mosquito nets to prevent mosquito bites. Statistically significant differences were detected between participants' level of knowledge and their age ($p < 0.037$), colleges ($p < 0.039$), academic level ($p < 0.001$), and residence area ($p < 0.001$).

Conclusion: Findings revealed the lacuna of knowledge of participants regarding ZIKV. This finding arises the need for implementing ZIKA Virus health education program for university students.

Keywords: Zika virus, viral infections, knowledge, attitudes, prevention.

الملخص

الخلفية: فيروس زيكا هو فيروس فلافي ينتقل عن طريق بعوض الايديز وقد تم التعرف عليه لأول مرة في غابة زيكا في أوغندا عام ١٩٤٧. هناك اهتمام سعودي بشأن زيكا والسلطة الصحية السعودية تحاول بذل قصارى جهدها لمنع أي تفش للمرض آخذين في الاعتبار أن التدابير والاحتياطات التي يأخذها الناس تعتمد على معرفتهم ومواقفهم تجاه الأمراض المعدية.

الأهداف: تهدف الدراسة إلى تقييم معرفة واتجاهات طلاب الكليات الصحية تجاه فيروس زيكا والوقاية منه في جامعة القصيم بالمملكة العربية السعودية بالإضافة إلى تحديد العوامل المرتبطة بالمستوى المعرفي للطلاب.

منهج الدراسة: تم إجراء دراسة مقطعية مستعرضة بين ٣٤٣ من طلاب الكليات الصحية بجامعة القصيم. تم استخدام استبيان مكون من ٤٦ سؤالًا لتقييم معرفة واتجاهات الطلاب تجاه فيروس زيكا وكذلك ممارسات الوقاية منه.

النتائج: بلغ متوسط أعمار المشاركين في الدراسة ٢٢ عامًا) انحراف معياري. (١,٦ ± وكان الإنترنت المصدر الأكثر شيوعا للحصول على المعلومات. بشكل عام كان هناك افتقار للمعرفة عن فيروس زيكا لدى معظم المشاركين (٧٩,٩٪ ,n ٢٧٤=) وسلوك إيجابي (n= ٢٩٤ ,٨٥,٧٪) فيما يتعلق بالرغبة فى معرفة المزيد عن فيروس زيكا. فيما يتعلق بممارسات الوقاية، أكد أكثر من نصف المشاركين (n=١٩١ ,٥٤,٧٪) على استخدام الناموسيات لمنع لدغات البعوض. تم الكشف عن فروق ذات دلالة إحصائية بين مستوى معرفة المشا ركين وأعمارهم (P <٠,٠٣٧) ، والكليات التي يدرسون بها (p<٠,٠٣٩) ، و المستوى الأكاديمي (P <٠,٠٠١) وكذلك مكان الإقامة (.(P <٠,٠٠١

الخلاصة: كشفت النتائج عن نقص معلومات الطلاب المشاركين فيما يتعلق بفيروس زيكا. تظهر النتائج الحاجة إلى تنفيذ برامج توعوية عن فيروس زيكا لطلاب الجامعة.

Introduction

Recently, there were series of emerging infectious diseases worldwide and ZIKV is the last in this series of several outbreaks.[1] ZIKV was discovered first in 1947 in monkeys, and then in humans in Uganda.[2] In 2016, the Singapore Ministry of Health reported a cluster of new infections related to ZIKV.[3] In March 2017, the World Health Organization (WHO) reported that 84 countries found evidence of mosquito-borne transmission of ZIKV, while 61 countries reported human ZIKV cases.[4] ZIKV is a vector-borne disease transmitted by a biting mosquito of the Aedes species in the daytime, predominantly Aedesaegypti,[5-9] which has recently caused epidemics in many Latin American countries. However, during the outbreak, it was discovered that ZIKV infection is linked to adverse pregnancies and birth defects, notably microcephaly and other serious brain anomalies.[1] Nonvector borne transmission is through direct human to human transmission (i.e., sexual contact, breastfeeding, or contaminated blood transfusion);moreover, the infected mother can pass ZIKV to her fetus during pregnancy by RNA.[10] ZIKV infection tends to be mild, self-limited, and asymptomatic in approximately 80% of cases.[7,9,11] Symptomatic ZIKV infection is also usually mild with the main manifestations of low grade fever, fatigue, headache, and conjunctivitis.[12] ZIKV can cause severe neurological complications, including acute myelitis, meningitis, Guillain-Barré syndrome or encephalitis.[13-16] Vaccines are not yet available, while protection against mosquito bites, control of vector and reduction of sexual transmission are confirmed to prevent spread of the virus.[17,18] Recently, a pharmaceutical company in India claimed to manufacture a vaccine, such that clinical trials would soon be initiated.[19-21] WHO has declared ZIKV to be a Public Health Emergency of International Concern (PHEIC). Since this declaration, guidelines for testing and clinical management of ZIKV disease and associated complications have been issued by the WHO and the US Centers for Disease Control and Prevention (CDC).[22-23] Many studies were done around the world about knowledge, and attitudes regarding ZIKV among university students; one study done at a public university, USA among 613 undergraduate students, showed that most students (88.1%) had some basic knowledge of Zika virus.[24] Another study from university in Cebu city, Philippines revealed a moderate knowledge among university students regarding Zika virus.[25] In Saudi Arabia, a large-scale survey on medical students of King Abdullaziz University, Jeddah revealed that 77.5% of the participants had poor knowledge, 15% obtained fair level and 7.5% had satisfactory level of knowledge about ZIKV.[26]

In Saudi Arabia, the situation is complicated; The Kingdom of Saudi Arabia (KSA) hosts one of the largest annual mass gatherings in the world; around 7 million Muslims come for religious tourism (Umrah and Hajj annually), and thousands come from Latin America, where ZIKV is prevalent.[27,28] There is a high health alert in KSA concerning the

ZIKV infection; after a large outbreak of dengue in 2009 in Mecca, the Saudi Ministry of Health distributed pamphlets on ZIKV and its preventive measures to increase awareness of people.[29-30] While Saudi Arabia has advanced surveillance and serological testing, and a sophisticated epidemiology work force, the first responding health teams and facilities are yet to be formally educated in detecting and reporting ZIKV infection. Without comprehensive public health initiatives and aggressive education campaigns, the potential for unreported cases in KSA remains high. Health Colleges' students, as future practitioners, should have sufficient information regarding ZIKV. Thus, it is important for future healthcare teams to have sufficient knowledge in their own clinical settings. The present study aims to assess the level of knowledge and attitudes towards ZIKV and its prevention among Health Colleges' students at QU, Saudi Arabia. In addition, to identify factors associated with level of knowledge regarding ZIKV.

Methods

Design and setting

A cross-sectional study using a self-administered questionnaire took place between September and October 2018 among students at Qassim University.

Study sample

Participants were recruited from the Health Colleges: Medicine, Nursing, Applied Medical Sciences, Pharmacy, and Dentistry. All colleges at university were represented, while the sample was calculated statistically; 10% of students from each college were included according to the number of students in each college. Eligibility criteria for students were as follows: (1) enrolled as an undergraduate student in one of the health colleges, (2) Affiliated as a sophomore, junior, or senior in academic level, and (3) signing the consent form for participation. A total of 343 students (Male and Female) were included by stratified random sampling method based on their academic level and college at the university.

Structure questionnaire

Based on a review of the literature [8,27,31] an initial draft of the questionnaire was developed and content validity was assessed by a panel of academic staff members who are experts in survey research (n=4)[32]. The drafted version of the questionnaire was reviewed by experts who suggested changes to improve its relevance. After that, a pilot study (pretest) was performed with 20 students to determine test-retest reliability. In addition, Cronbach's alpha (a measure of internal consistency reliability) [33] was used for knowledge, attitudes, and prevention practice sections, which were 0.86, 0.79, and 0.76, respectively. The respondents were asked for feedback on difficulty and clarity of the questions. Based on the given responses, a few modifications were made to improve the clarity of the questionnaire. The final version included four major sections: the first section composed of 8 questions covering socio-demographic data and

participant characteristics (age, gender, college, residential area, academic level, mother's education, father's education, and their source of information regarding ZIKV). The second section assessed participants' knowledge related to ZIKV, which consisted of 28 items focused on whether there are cases of ZIKV in Saudi Arabia, population groups at risk for it, routes of transmission, and incubation period. In addition to statements related to symptoms, treatment, complications and availability of a vaccine against ZIKV. as other dangerous infectious diseases emerging in the KSA were known as Middle East Respiratory Syndrome (MERS). The third section focused on participant attitudes to ZIKV, based on 16 statements, answered with a 3-point Likert-scale "agree, I don't know and disagree". The fourth section concerned self-reported prevention practices against ZIKV; it consisted of six multiple choice questions (MCQs) focused on the availability for ZIKV prevention, as well as who was responsible for ZIKV prevention, what action should be taken to prevent mosquito bites, attitudes toward travelling to a country where ZIKV is found, preventive measures to protect people, and the reason to refraining from precautions to prevent ZIKV infection.

Data collection

Data collection was carried out by distributing the questionnaires in the presence of the class teacher. Only students who offered complete responses to questionnaire items were included in the statistical analysis to ensure data quality. Collected data were coded, reviewed, and entered the SPSS software program for analysis (version16; SPSS Inc, Chicago, IL, USA). Frequency and percentages were calculated by descriptive analyses. A scoring system was used as follows: for knowledge (28 items), a score of "1" for the correct answer and "0" for the incorrect answer or "don't know the answer." The total knowledge score ranged from 0 to 28 and was categorized into satisfactory knowledge, which defined as correct answers to > 21items (>75% of the total score), fair knowledge was 14-21items (50-75% of the total score), and poor knowledge <14 items (<50% of the total score) [34]. A result with a p-value < 0.05 was considered statistically significant.

Ethical considerations

The research protocol was approved by the Deanship of Scientific Research and ethical approval was obtained from the Research Ethics Committee of the nursing research center at Qassim University. Informed consent was obtained from all participants after given a cover letter with a detailed description of the study. Participants were informed regarding voluntary participation, privacy and confidentiality of data.

Results

Socio-demographic characteristics

Of 420 students approached, 368 responded to the survey, with a response rate of 87.6%. However, 25 questionnaires were excluded due to non-commitment during completing

the survey to the instructions. The final statistical analysis included 343 surveys, with 289 females (84.3%) and a mean age of 22 years. Most parents had a university degree or higher: 63.3% (n=217) of mothers and 58% (n= 199) of fathers. The main source of knowledge regarding Zika virus was the Internet, followed by TV, the university and interpersonal (Table 1).

Table 1: Socio-demographic characteristics of the participants

Characteristics		Descriptive statistics
Overall sample, *n* (%)		343 (100%)
Age	Median (Range)	22 (20–25)
	Mean (SD)	22 (1.6)
Gender, *n* (%)	Male	54 (15.7%)
	Female	289 (84.3%)
College, *n* (%)	Medicine	65 (19%)
	Nursing	115(33.5%)
	Pharmacy	47(13.7%)
	Dentistry	69 (20.1%)
	AMS	47 (13.7%)
Academic level, *n* (%)	Senior	183 (53.4%)
	Junior	117(34.1%)
	Sophomore	43(12.5%)
***Residence *n* (%)**	Rural	6 (1.7%)
	Urban	336 (98%)
Mother education	Elementary school	43 (12.5%)
	Preparatory school	26 (7.6%)
	Secondary school	57 (16.6%)
	University and higher	217 (63.3%)
Father education	Elementary school	31 (9.1%)
	Preparatory school	22 (6.4%)
	Secondary school	91(26.5%)
	University and higher	199 (58%)

Source of Zika information	Internet	273 (79.5%)
	University	91(26.5%)
	Newspaper	27 (7.9%)
	Posters	31 (9.1%)
	TV	111(32.4%)
	Healthcare professional	64 (18.7%)
	Interpersonal	69(20.1%)
	Others	25 (7.3%)

Knowledge

Figure (1) illustrated students' knowledge regarding ZIKV's symptomatology; more than two-thirds of respondents (72%) correctly identified fever as an associated symptom, and many respondents succeeded in identifying significant symptoms, such as skin rash (42%) and conjunctivitis (39%), while around one-fifth (20.5%) incorrectly selected bloody diarrhea as a symptom of ZIKV. Furthermore, nearly half the participants (47%) were completely unaware of the significant symptoms of ZIKV and preferred the statement "I don't know."

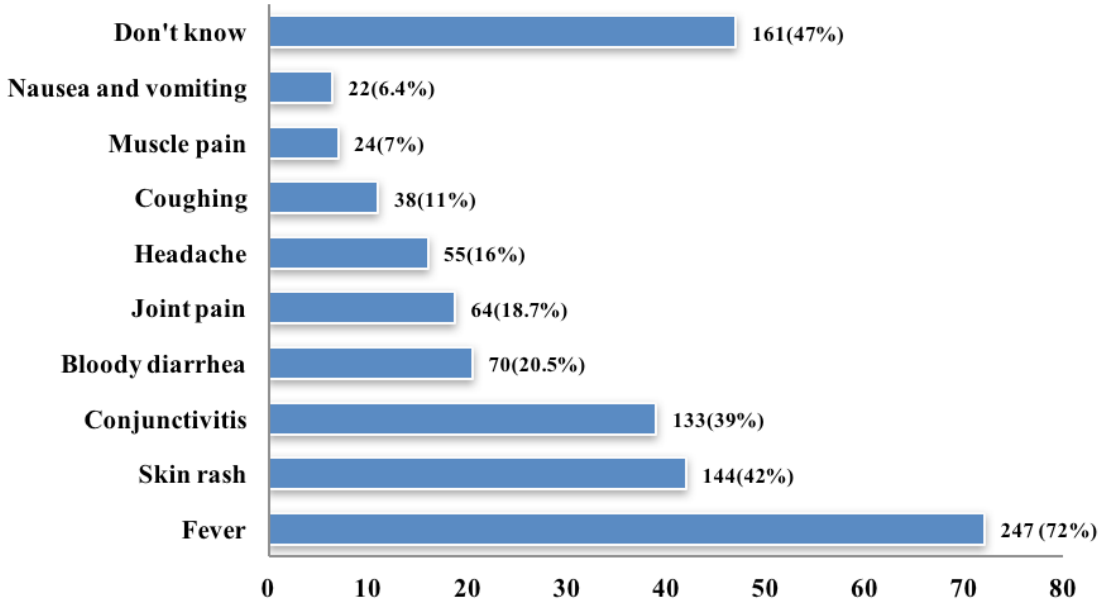


Figure 1. Participants' knowledge of symptoms/signs of ZIKV (%)

It is apparent from Table 2 that more than half the participants (51.3%) correctly recognized that infected mosquito bites and sexual relation with an affected person (53.1%) were among the modes of ZIKV transmission. However, only 9.6% of them correctly identified the usual incubation period of ZIKV, and less than a quarter (23.9%) knew that ZIKV could be transmitted through vertical routes, from an infected pregnant woman to her baby. Less than a quarter of participants (24.2%) identified there was no approved ZIKV vaccination until recently. Table 2 shows that the largest percentage of correct answers among participants (81.9%) was related to the most dangerous infectious disease emerging in Saudi Arabia, which is MERS.

Table 2. Knowledge of item frequencies regarding Zika among Health Colleges' students (n=343)

Statement	Correct response	No. of correct responses (%)
Knowledge score (Min-max)	**(0-28)**	
1. There are cases of Zika infection in Saudi Arabia	False	65 (19.0)
2. Person can be infected with Zika through coughing and sneezing (n=340)	False	174 (50.7)
3. Person can be infected with Zika by eating contaminated food (341)	False	123 (35.9)
4. Pregnant mother with a ZIk V can transmit it to her fetus	True	82 (23.9)
5. ZIKV can be transmitted to a woman through sexual relation with her affected husband	True	182 (53.1)
6. The usual incubation period of ZIKV ranged from 3–12 days. (n=333)	True	32 (9.6)
7. Zika disease is mild in adults	True	159 (46.4)
8. If a pregnant woman has Zika, her baby is at risk of microcephaly	True	144 (42.0)
9. ZIkV is thought to cause GuillainBarré syndrome	True	75 (21.9)
10. There is an approved Zika vaccination	False	83 (24.2)
11. A person can get ZIkV from infected mosquitoes	True	176 (51.3)
12. There is currently no cure for ZIKV	True	132 (38.5)
13. The most common treatment for ZIKV is antibiotics	False	191 (55.7)
14. The most dangerous infectious disease in KSA nowadays (Corona)	True	281 (81.9)

Attitudes

The attitudes of Health Colleges' students towards ZIKV are presented in Table 3, with more than half of participants (53.9%) had positive attitude toward statement " population all over the world could control the ZIKV epidemic" and about two third of them (70.5%) also had positive attitude regarding statement that vaccination for ZIKV was very important. Nearly two-thirds of Health Colleges' students (68.8%) positively responded to the statement "ZIKV is a deadly infectious disease, while more than half of participants (58.9%) had positive attitude toward state-

ment "Saudi residents are at risk of contracting ZIKV". A highly positively attitude (85.7%) of students were detected regarding the interest in learning more about ZIKV. The same table showed a negative attitude of more than half of participants (n=174, 50.7%), (n=185 , 54.8%) (n=186, 54.2%) toward "The spread of ZIKV makes me worried about my family", "Zika patients need to be treated by an infectious disease specialist" and "The best way to prevent Zika infection is to protect against mosquito bites" respectively.

Table 3. Response of the Health colleges' students of Qassim University to attitude questionnaire on ZIKV

No.	Questionnaire statements	Positive Attitude n (%)	Negative Attitude n (%)
1	I am confident that the world's population can control ZIKV epidemic	185 (53.9%)	158 (46.1%)
2	Zika's infection is a deadly infectious disease	236 (68.8%)	107 (31.2%)
3	Saudi residents are at risk of contracting ZIKV	202 (58.9%)	141 (41.1%)
4	I think the vaccination for Zika is very important	242 (70.5%)	101(29.5%)
5	I am interested in learning more about Zika's disease	294 (85.7%)	49 (14.3)
6	I have a bad feeling about ZIKV	175 (51%)	168 (49.0%)
7	The spread of ZIkV makes me worried about my family	169 (49.3%)	174 (50.7%)
8	All pregnant women should be examined to make sure they do not get Zika	212 (61.8%)	131 (38.2%)
9	Zika disease can spread easily in Saudi Arabia	308 (89.8%)	35 (10.2%)
10	I think it is dangerous to travel to Zika's countries	226 (65.9%)	117 (34.1%)
11	There is no possibility of Zika happening in KSA	329 (95.9%)	14 (4.1%)
12	Zika patients should be treated in isolation because it is a very contagious disease	315 (91.8%)	28 (8.2%)
13	Zika patients need to be treated by an infectious disease specialist	155 (45.2%)	188 (54.8%)
14	The best way to prevent Zika infection is to protect against mosquito bites	157 (45.8%)	186 (54.2%)
15	The government should prohibit foreigners from entering Saudi Arabia if they have symptoms of Zika disease	183 (53.4%)	160 (46.6%)
16	Zika disease is a burden on health systems in the countries where it spreads	282 (82.2%)	61 (17.8%)

Prevention practices

Regarding prevention practices**,** as shown in figure 2, most participants (81%) confirmed that ZIKV can be prevented and regarding the responsibility of Zika' prevention, around half of participants (50.4%) emphasized individual responsibility in preventing Zika infection; alternatively, 46.9% saw health workers as responsible for ZIKV prevention. Considering the preventive measures that should be taken, more than half of participants (55.7%) confirmed using mosquito nets and 46.1% preferred using mosquito repellent to prevent mosquito bites (figure 3).

Figure 2: Participants' information about whose responsibility to prevent ZIKV

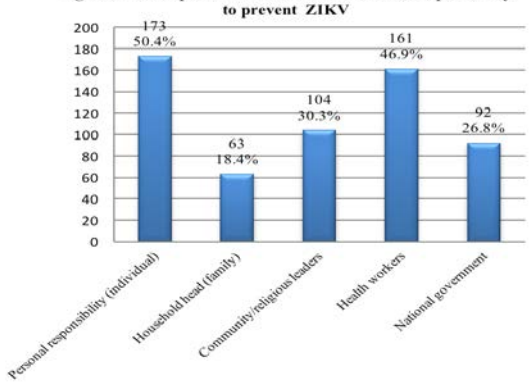


Figure 3: Participants' information about action should be taken to prevent mosquito bites

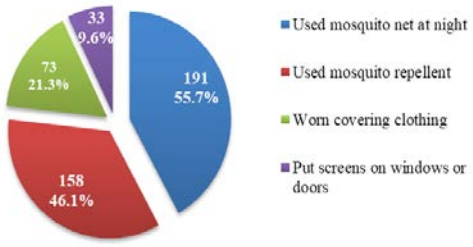
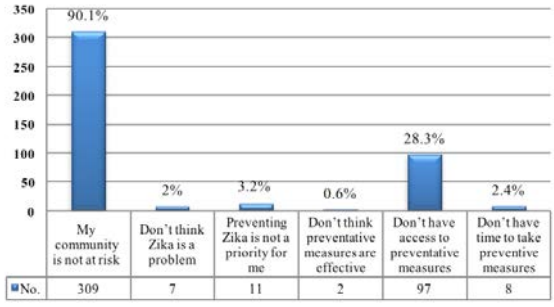


Figure 4: Participants' information about why they have not taken any action to prevent their community from getting Zika



As regards to actions taken to protect the community from ZIKV, most students (92.1%) took no action with 90.1% justifying this as their community not being at risk (figure 4). Table 4 showed that the participants' level of knowledge regarding Zika revealed that 79.9% had poor knowledge, 13.4% had a fair level of knowledge, and 6.7% had a satisfactory level of knowledge. The same table illustrated that 72.2% of participants 21 years and over compared to 95.6% of younger participants (less than 21 years), having obtained poor ZIKV knowledge scores, which rendered this difference statistically significant ($p< 0.037$). Gender difference regarding Zika knowledge was statistically insignificant among participants ($p<0.132$), where 83.3% of males compared to 79.2% of females having poor ZIKV knowledge. The same table revealed that the percentage of those with fair and satisfactory knowledge scores increased with advancing academic level, with a highly statistically significant difference detected ($p < 0.000$). In addition, the ZIKV knowledge score differentiated significantly among participants regarding their colleges and residential area; ($p < 0.039$), ($p < 0.001$), respectively.

Table 4. Factors associated with participants' level of knowledge

Variables	Characteristics	n (%)	Level of knowledge		*P-value*
			Fair & Satisfactory (n = 69, 20.1%) n (%)	**Poor (n = 274, 79.9%) n (%)**	
Age group	Mean ±SD <21 yrs ≥ 21 yrs	22 ±1.6 113 (32.9) 230 (67.1)	 5 (4.4) 64 (27.8)	 108 (95.6) 166 (72.2)	0.037

Gender	Male	54 (15.7%)	9 (16.7)	45 (83.3)	0.132
	Female	289 (84.3%)	60 (20.8)	229 (79.2)	
College, n (%)	Medicine	65 (19%)	19 (29.2)	46 (70.8)	0.039
	Nursing	115 (33.5%)	8 (7.0)	107 (93.0)	
	Pharmacy	47 (13.7%)	10 (21.3)	37 (78.7)	
	Dentistry	69 (20.1%)	23 (33.3)	46 (66.7)	
	AMS	47 (13.7%)	9 (19.1)	38 (80.9)	
Academic level	Senior	183 (53.4%)	51 (27.9)	132 (72.1)	< 0.001
	Junior	117 (34.1%)	18 (15.4)	99 (84.6)	
	Sophomore	43 (12.5%)	0 (0.0)	43 (100)	
***Residence n (%)**	Rural	6 (1.7%)	0 (0.0)	6 (100)	< 0.001
	Urban	336 (98%)	69 (20.5)	267 (79.5)	

*One was missing**

Discussion

Based on the declaration of WHO that ZIKV is a public health emergency of international concern,[35] it becomes important for healthcare personnel to constantly update their knowledge regarding ZIKV infection. According to the current results, most participants at all health colleges had been informed regarding ZIKA from the Internet. Although it is recently the most common source of information, especially for young adults, but they must be sure that these websites can be trusted and have complete knowledge. This is in accordance with a variety of previous studies, [36-39] which also reported that most of their respondents gained their knowledge from Internet and social media. Our findings exhibit knowledge gap among Health Colleges' students regarding Zika, which is similar to surveys conducted among undergraduate students at George Mason University in the USA.[34] This is similar among university students in Saudi Arabia[38] and doctors in Indonesia.[23] Another concern is participants' false understanding regarding the availability of approved vaccines and the presence of a cure for ZIKV disease. This supports how similar results had been published in a previous study.[40] Approximately half of participants know that a mosquito bite is the most common mode of ZIKV transmission, but only 9.6% identified the incubation period. This discrepancy coincides with previous studies for medical students (n=426) in Jeddah, Saudi Arabia,[39] while better results were noted in healthcare students in a study conducted in four cities in Colombia (2015). Almost all participants knew the mode of transmission and incubation period; this dissimilarity is clear if it is known that those in Colombia attended a ZIKV symposium beforehand the study.[40]

Concerning the students' attitudes, more than half of participants were confident that the world's population could control the ZIKV epidemic and the majority of participants were interested in learning more regarding ZIKV disease, where results are in accord with pre-

vious researches.[35,40] One notable finding of the present study is the lack of participants' knowledge, yet the majority of participants avoided travelling to a country where ZIKV was found and more than half of them confirmed the use of mosquito netting as a measure to prevent mosquito bites; this exhibits better participant prevention practices, which is in accordance with a previous study reporting in sufficient evidence to correlate knowledge with improved practices.[39] Therefore, further studies should assess the link between knowledge and participant practices regarding ZIKV prevention.

Limitations of the study:

The present study has certain limitations, in which potential areas uncover the beliefs of Health Colleges' students at QU toł ward ZIKV disease, and students' knowledge and attitudes from non-health colleges. Larger studies would comprehend students and the public in the KSA. Interventional studies, particularly educated ones, would increase student knowledge and that of the public on ZIKV infection. Another limitation is that all information in this study was self-reported and that any bias was due to having socially desirable attitudes. Follow-up studies, with knowledge and preventive measures, are vital to evaluate the effectiveness of these measures. There is a need to develop precaution strategies toward ZIKV, particularly in the KSA and the existence of large numbers of religious tourism during Hajj and Umrah.

Conclusion

In conclusion, findings revealed a lack of knowledge regarding ZIKV among Health Colleges' students at QU, but positive attitudes on learning more regarding ZIKV. Therefore, there is a greater need for implementing a Zika symposium for university students, focused on arousing greater knowledge regarding the disease. Our study findings are useful for policy makers at QU, as well as other health professionals for planning, implementing, and evaluating Zika awareness programs.

Conflict of interests

Authors declare no conflict of interest

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