



Journal Homepage: - www.journalijar.com
**INTERNATIONAL JOURNAL OF
 ADVANCED RESEARCH (IJAR)**

Article DOI: 10.21474/IJAR01/4005
 DOI URL: <http://dx.doi.org/10.21474/IJAR01/4005>



RESEARCH ARTICLE

MIDDLE EAST RESPIRATORY SYNDROME CORONAVIRUS: ARE MAKKAH MEDICAL STUDENTS SUFFICIENTLY AWARE OF IT?

Osama Abdulqadir Khairoalsindi^{1*}, Anas Muwaffaq Tayeb¹, Raghad Mohammad Mandora¹ and
 Muhammad Irfanullah Siddiqui²

1. Umm Al-Qura Medical College, Umm Al-Qura University, Makkah, Saudi Arabia.
2. Department of Community Medicine, Faculty of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia.

Manuscript Info

Manuscript History

Received: 15 February 2017
 Final Accepted: 11 March 2017
 Published: April 2017

Key words:-

MERS-CoV, Coronavirus, Medical Students, Awareness, Saudi Arabia, Makkah.

Abstract

Background and objectives: Middle East Respiratory Syndrome Coronavirus continues to pose great challenges to Saudi Arabia and many other countries. The medical students in Makkah, in addition to their role in spreading the awareness among the indigenous population of their community, possess a crucial role owing to their unique setting and their major participation in the annual Hajj event. This study was designed to assess the awareness among medical students of Umm Al-Qura Medical College in Makkah towards MERS-CoV. **Methodology:** In the summer vacation, a cross-sectional study was conducted on medical students who finished the second, third, fourth, fifth, and sixth academic year using a previously constructed questionnaire that was used in a study on dental students in Jeddah, Saudi Arabia.

Results: Among the 317 respondents, 92.4% knew at least one definition of MERS-CoV. The mean awareness scores for the second, third, fourth, fifth and sixth years were 31%, 51%, 61%, 63%, and 69% respectively.

Conclusions and Recommendations: A general moderate knowledge was found among the respondents; however, continuous rigorous campaigns and courses by the Saudi Ministry of Health and other authorities are needed for all medical students, in particular for the second and third year students who demonstrated a relatively poor knowledge. The newly implemented academic curriculum in UQU Medical College needs to contain more comprehensive infection control lectures and activities; the distinguished setting of the Medical College underscores this need. Furthermore, future similar studies on all other health colleges in Umm Al-Qura University are advocated.

Copy Right, IJAR, 2017,. All rights reserved.

Introduction:-

Middle East Respiratory Syndrome Coronavirus (MERS-CoV) is a Betacoronavirus, one of four genera under the family Coronaviridae and the subfamily Coronavirinae. Coronaviruses inhabit many different reservoirs and can afflict humans.(1) The isolation of a novel coronavirus was reported by a physician in September 2012, in Saudi Arabia.(2) Shortly thereafter, the same strain was discovered in a Qatari patient in the United Kingdom (UK).(3)

Corresponding Author:- Osama Abdulqadir Khairoalsindi.

Address:- Umm Al-Qura Medical College, Umm Al-Qura University, Makkah, Saudi Arabia.

Despite the early geographic restriction of MERS-CoV to the Middle East countries, newly reported cases related to traveling were identified in the United Kingdom, France, Germany, and Italy.(4-7) MERS-CoV is transmissible from animals to humans.(8) According to the analysis of viral genomes in animals, it was found that the evolution of MERS-CoV is related to bats and camels.(9) Signs and symptoms of MERS-CoV vary. They mainly include cough and shortness of breath, as shown by evidence.(10) Up to date, there is no specific treatment or antiviral drugs for MERS-CoV, only supportive treatment is considered for management.(11)

During Hajj season, millions of Muslims pilgrim to Makkah city as a part of their religious rituals. This renders the city a fertile environment for transmission and spreading of the virus. The Saudi Ministry of Health (MOH) website provides educational health tips regarding the frequent inquiries, prevention of transmission and dealing with infected cases.(12) There were many studies and campaigns that took place for the purpose of increasing the awareness level among citizens and pilgrimages.(13)

The awareness of MERS-CoV is of pivotal importance for the prevention of transmission and spreading of the virus. During Hajj season, the MOH provides courses and holds comprehensive symposiums for medical students concerning transmissible diseases, as the role of medical students is undoubtedly substantial in spreading the awareness among their families, friends, and communities.

This study was devoted to assess the awareness level among medical students of Umm Al-Qura Medical College in Makkah towards MERS-CoV.

Materials and Method:-

Study Area and population:-

The study was conducted in the summer vacation at Umm Al-Qura University (UQU), the only university in Makkah, Saudi Arabia. Makkah is a holy city of Islamic religion in which millions of Muslims visit each year for pilgrimage as a part of Muslims' religious duties.

The total study population is 1380 students (700 males and 680 females). The population of the study comprised all undergraduate males and females medical students in Umm Al-Qura Medical College who recently completed either their second, third, fourth, fifth or sixth academic year. For the rest of this article, whenever an academic year is mentioned, the students who just passed that year are meant.

Study design and sample size:-

This is a cross-sectional observational study that was conducted using surveys. For sample size estimation, we considered a confidence interval of 95% and an error margin of 5%. As there were no previous studies that addressed MERS-CoV awareness among UQU medical students, a conservative choice of 50% awareness was considered for sample size estimation. For the population count, the total number of students from the second to the sixth year is 1380. This would yield a required sample size of 301 students. We added 10% to account for the non-response factor and to ensure representativeness. Thus, a total of 330 students were selected to fill the surveys.

Sampling technique:-

We selected the subjects randomly from the list of students provided by the academic office of the Medical College. Data were collected during the summer vacation from each selected student. We selected the study sample by a multistage stratified random sampling technique with proportional selection from all academic years and both genders. Then we contacted the selected students by text messages. We included explanations of the aims and objectives of the study in each message. Students were demanded to address their approval as a text message reply prior to the commencement of filling the questionnaire form. We began sending the text messages of invitations to participate in the study at the beginning of June 2016. One day thereafter, we sent text messages to each student as a reminder to fill the questionnaire. We were answering all relevant questions from the students who could not understand any part of the survey. In order to ascertain that all samples are collected at the same time, we collected the data for two consecutive weeks. The data were gathered by an uploaded Google document and then were copied to the statistical software program for the statistical analysis performance.

Study instrument:-

We adopted a questionnaire of a study that had been conducted on dental students in Al-Farabi Dental College, Jeddah, Saudi Arabia.(14) The questionnaire was constructed in English according to relevant information provided

by the Saudi MOH website. We revised the questionnaire carefully and updated the info provided from the MOH website. Furthermore, we added more relevant questions for evaluating the awareness towards MERS-CoV. In addition, we converted some multiple-choice questions into check-boxes questions. Moreover, before distributing the questionnaire, the study instrument was shown to three undergraduate medical students, and two medical interns, all were not a part of the study population. They addressed their opinion and proposed suggestions to make the questionnaire simpler and shorter. Amendments were made accordingly. The final form constituted of two main sections; the first section pooled data with regards to the baseline characteristics (age, gender, GPA, monthly income,..., etc.). The second section contained multiple choice questions, in which only one answer can be chosen; and checkboxes questions, in which more than one answer can be selected. This second section was concerned with the assessment of the awareness towards MERS-CoV in particular perspectives; these included the definition, symptoms, etiology, preventive measures, transmission and treatment applications. Additional questions related to the mortality rate, incubation periods, sources and others as well were also gathered.

Ethical considerations:-

The questionnaire form was anonymous such that no nominative information was gathered. Ethical approval was obtained from the Ethical Committee of Faculty of Medicine, UQU.

Statistical analysis:-

A scoring system was used wherein two scores were given for a completely correct answer, one score for an accepted answer, and zero scores for choosing wrong answers.

Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and mean and standard deviation (SD) for quantitative variables. Pearson correlation test was applied to determine the degree of association between the awareness score and the GPA. The GPA is presented in percents for the sake of simplicity, instead of the four-point system of UQU. The level of statistical significance was set to be less than 0.05.

Results:-

Baseline characteristics of the study participants:-

Out of the 330 questionnaire forms that were sent, 317 were completed and were valid for analysis. The frequency distribution of responses from each of the five academic years was 66, 61, 61, 56, 76 for the second, third, fourth, fifth, sixth year respectively. Table 1 demonstrates the socio-demographic information for the population of students. The average age for all students was 22.0 years (SD=1.46). Almost half of the study respondents were males (50.5%). The majority of the students lived inside Makkah city (88.6%), and most of the respondents were not married (91.5%). As for the family income, 46.8% of the students' family incomes ranged between 5001-15000 Saudi Riyal. The GPAs varied among the students with the highest proportion (45.5%) having GPAs from 75% to 89.9%. More than a third of the sample (38.8%) obtained their knowledge from media, and 78 (24.6%) of the sample gained their knowledge from college.

Awareness of MERS-CoV:-

Overall, 117 (37.5%) students knew the definition of MERS-CoV as Middle East Respiratory Syndrome, and almost half of the sample (49.8%) knew additional definitions as well. The majority of respondents (76.0%) were aware that MERS-CoV is contagious. However, 40 (60.6%) of the second year students had no idea whether MERS-CoV is contagious or not. There were 132 (41.6%) students who identified the incubation period of the virus as 2-14 days. Surprisingly, a total of 33 (10.4%) students thought that SARS is the same as MERS-CoV, and a sizable proportion (48.3%) had no idea whether they are similar or not. Moreover, only 87 (27.4%) were able to estimate the approximate mortality rate as 40%, while there were 30 students (9.5%) who responded with 5% mortality rate (Table 2).

Table 3 illustrates that only 45 (14.2%) respondents were aware of all the implicated symptoms together (fever and cough, shortness of breath, diarrhea, congestion of the nose and throat). In addition, only 2 (3.0%) and 3 (4.9%) of the second and third year students, respectively, knew all symptoms together. Concerning the source of infection, 42 (13.2%) identified bats and camels as sources. In addition, there were no second year students (0%) who identified both bats and camels as sources for the infection. Only a minority of students (21.5%) were knowledgeable regarding the transmission of the virus by close contact with infected patients, infected animal products, through droplets, touching the face after touching a contaminated surface. Moreover, a total of 70 students (22.1%) could

identify all the preventive measures (washing hands with sanitizers, covering the nose and mouth when coughing or sneezing, avoiding close personal contact with infected patients, avoid touching eyes and nose and mouth, wearing face mask). As far as the management is concerned, 65.6% realized that MERS-CoV is managed through supportive treatment, and, notably, half of the second year students (50.0%) had no idea regarding the treatment and management. Of surprise, there were 64 (20.2%) and 40 (12.6%) students who thought that vaccination and antibiotics, respectively, are parts of the treatment approach.

Awareness scores and its association with the students' GPAs:-

Figure 1 demonstrates that the mean awareness scores for the second, third, fourth, fifth and sixth years were 31%, 51%, 61%, 63%, 69% respectively. A significantly positive relationship was found between the awareness score and the academic GPA. This association was found only among the fourth ($p=0.041$) and sixth ($p<0.001$) year students (Table 4).

Discussion:-

The present study has attempted to evaluate the awareness of UQU medical students towards MERS-CoV. This study has recruited undergraduate medical students from all levels via stratified random sampling, making sure that the knowledge of each academic year students can be observed and analyzed thoroughly.

In contrast to the other studies, we have conducted ours on all undergraduate academic years, as this is necessary for our distinguished setting and its great importance. Other studies that were carried out on Saudi medical and dental students from Jeddah and Riyadh cities have elaborated a general good knowledge. Our results demonstrate almost consistent findings with these studies.(14-16) There is a trend in our study that shows, with clarity, that for advancing in medical college there is an increase in awareness. This is obvious as that each year spent in college entails that the student gains more knowledge and experience. This also explains the apparent higher knowledge of the healthcare workers in Makkah.(17)

One might conclude that this level of awareness is sufficient for medical students in general. However, the results also highlighted unsatisfactory knowledge for the lower academic year students.

Our study has revealed that only a total of 24 (7.6%) students had no idea about MERS-CoV, and the majority of these were second year students (20 students). Almutairi M. has shown, in a study conducted on a sample of undergraduate and postgraduate dental students of Riyadh, that 36.2% ($N=235$) of the sample population had not heard about MERS-CoV.(16) 76% of our medical students realized that MERS-CoV is contagious; however, Alnakli Z. (18) has demonstrated that Saudi public was more acquainted with this notion, as 87.8% ($N=90$) knew that MERS-CoV is contagious. This could be, at least in part, due to that Alnakli Z. study included subjects with various ages, such that more than 43% of all participants were more than 29 years old.(18) Furthermore, 19.7% of the third year students believed that SARS is the same as MERS-CoV. Oddly, the third year students (meaning those who just finished their third year less than two months prior to the study) are more in proximity than other academic years in terms of the time elapsed since the Microbiology course. Moreover, 13 (21.3%) of the third year students thought that the mortality rate for MERS-CoV is 5%.

With regards to the symptoms, diarrhea comprised the least known symptom with a total of 108 times identified (34.1%). This might be ascribed to that, in awareness campaigns, diarrhea is not stressed upon as a manifestation of MERS-CoV as it is an atypical symptom for MERS-CoV.(19) Unexpectedly, a high proportion of the second and third year students (56.1% and 29.5%, respectively) had no idea about the source of infection. There is a common public misconception for the availability of vaccination for MERS-CoV.(18) This common misconception has strikingly been found among the second year students, as there were 22 (33.3%) students who thought that there is a vaccination for MERS-CoV.

Every year, millions of people head towards Makkah as a part of Hajj obligation. Hajj is the most massive religious mass gathering over the globe and is an Islamic occasion that is hosted annually by Saudi Arabia. Hajj is one of the five constitutive pillars of Islam that must be undertaken at least once by each adult Muslim who is able-bodied and have the fund to do so.(20) Hajj seasons of 2012 and 2013 have collectively attracted more than 5 million pilgrims from 184 countries.(21) Significant challenges are posed to the Saudi government and the global health security as well, as the inevitable crowding and proximity among these millions render the environment perfect for transmission of MERS-CoV. This might not create outbreaks among pilgrims only; instead, the exportation of these transmissible

infections to the pilgrims' countries is another major concern that might herald epidemics. The last global summary by the WHO demonstrates that since the emergence of the MERS-CoV in September 2012 till 5 December of 2016, 1841 laboratory-confirmed cases were reported worldwide, 80% of whom were reported by Saudi Arabia.(22) The Saudi government has formed many partnerships with many authorities to help in proactive surveillance, including WHO Collaborating Center for Mass Gatherings Medicine, UK universities, and many others.(20) Throughout the year, and especially before Hajj month, many awareness campaigns are held for the public Saudi citizens as a part of preparedness for such an event. The Saudi Ministry of Health, in concert with the Ministry of Hajj, are committed to disseminating advice for the pilgrims through various ways. These are made by coordinating with other health organizations from outside the kingdom, as the WHO, and by posting on the MOH website, and other ways as well.(20, 22, 23)

For the past years in the academic curriculum of UQU Medical College, the Microbiology course is held for the third year students, while the fourth year students are given infection control lectures in the Community Medicine course and are mandated to abide by the tutored preventive measurements for the rest of their clinical years. Unlike the third year students, it was not unexpected for the second year students to show such low grasping of MERS-CoV since they, meaning the second year students, have not been involved in any academic activities by the college in infection control. Starting from September 2016, UQU College of Medicine has adopted a new academic curriculum. One could argue that only the clinical year students are what matters and only them whom must be knowledgeable regarding the issue of infectious diseases spreading. However, besides their role in spreading the awareness among the indigenous population of their community, all medical students of Makkah possess a crucial role owing to their unique setting and their major participation in the annual Hajj event. This underscores the need to escalate the awareness about MERS-CoV for the lower academic years too. Hence, we advocate for continual rigorous awareness campaigns and additional educational activities for the second and third year students in particular regarding the contemporary issue of MERS-CoV.

Limitations:-

Our study, however, needs to be interpreted bearing in mind its context of limitations. The questionnaire had not included questions pertinent to the courses and campaigns that take place on regular basis for medical students. We could not identify whether the respondents are participating and benefiting from infection control extracurricular activities. Another shortcoming is that this study addressed only the medical students of UQU awareness, it did not encompass other health specialties, like dental and nursing college, etc.

Table 1:- Baseline characteristics of the study sample.

Category		n (%)
Age (years)	Mean (SD)	22.0 (1.46)
Gender	Male	160 (50.5%)
	Female	157 (49.5%)
Residence	Inside Makkah	281 (88.6%)
	Outside Makkah	36 (11.4%)
Social status	Single	290 (91.5%)
	Married	27 (8.5%)
Monthly family income*	Less than 5000	27 (9%)
	5001-15000	141 (46.8%)
	15001-25000	85 (28.2%)
	More than 25000	48 (15.9%)
Academic GPA	Less than 45.0%	5 (1.6%)
	45.0%-59.9%	27 (8.8%)
	60.0%-74.9%	78 (25.3%)
	75.0%-89.9%	140 (45.5%)
	More than 90.0%	58 (18.8%)
Source of knowledge	Media	123 (38.8%)
	College	78 (24.6%)
	Social community	61 (19.3%)
	MOH website	9 (2.8%)
	CDC website	1 (0.3%)
	Do not remember	45 (14.2%)

* In Saudi Riyals (1 \$=3.75 SR).

MOH, Ministry of Health; CDC, Centers for Disease Control and Prevention.

Table 2:- Frequencies of the selection for the multiple-choice questions for the Umm Al-Qura medical students.

		Academic year					
		Second year (N=66)	Third year (N=61)	Fourth year (N=61)	Fifth year (N=56)	Sixth year (N=73)	Total (N=317)
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
What is MERS-CoV?	Middle East Respiratory Syndrome*	26 (39.4%)	26 (42.6%)	18 (29.5%)	23 (41.1%)	26 (35.6%)	119 (37.5%)
	Viral respiratory illness*	0 (0.0%)	2 (3.3%)	0 (0.0%)	1 (1.8%)	0 (0.0%)	3 (0.9%)
	Coronavirus*	2 (3.0%)	3 (4.9%)	3 (4.9%)	2 (3.6%)	3 (4.1%)	13 (4.1%)
	All of the above**	18 (27.3%)	29 (47.5%)	40 (65.6%)	27 (48.2%)	44 (60.3%)	158 (49.8%)
	No idea	20 (30.3%)	1 (1.6%)	0 (0.0%)	3 (5.4%)	0 (0.0%)	24 (7.6%)
Is MERS-CoV contagious?	Yes* *	26 (39.4%)	44 (72.1%)	56 (91.8%)	46 (82.1%)	69 (94.5%)	241 (76.0%)
	No	0 (0.0%)	1 (1.6%)	1 (1.6%)	1 (1.8%)	0 (0.0%)	3 (0.9%)
	No idea	40 (60.6%)	16 (26.2%)	4 (6.6%)	9 (16.1%)	4 (5.5%)	73 (23.0%)
What is the incubation period of MERS-CoV?	2-14 days* *	7 (10.6%)	26 (42.6%)	28 (45.9%)	27 (48.2%)	44 (60.3%)	132 (41.6%)
	Other wrong answers	59 (89.4%)	35 (7.4%)	33 (54.1%)	29 (51.8%)	29 (39.7%)	185 (58.4%)
Is MERS same as SARS?	Yes	3 (4.5%)	12 (19.7%)	9 (14.8%)	4 (7.1%)	5 (6.8%)	33 (10.4%)
	No* *	12 (18.2%)	21 (34.4%)	35 (57.4%)	22 (39.3%)	41 (56.2%)	131 (41.3%)
	No idea	51 (77.3%)	28 (45.9%)	17 (27.9%)	30 (53.6%)	27 (37.0%)	153 (48.3%)
What is the approximate mortality rate of MERS-CoV infection?	40%* *	11 (16.7%)	11 (18.0%)	22 (36.1%)	22 (39.3%)	21 (28.8%)	87 (27.4%)
	5%	4 (6.1%)	13 (21.3%)	6 (9.8%)	3 (5.4%)	4 (5.5%)	30 (9.5%)
	Other wrong answers	51 (77.3%)	37 (60.7%)	33 (54.1%)	31 (55.4%)	48 (65.8%)	200 (63.1%)

*Acceptable answer, given one point.

*Correct answer, given two points.

MERS-CoV, Middle East Respiratory Syndrome Coronavirus; SARS, Severe Acute Respiratory Syndrome.

Table 1:- Frequency of Identification of the options for the multi-answer questions (checkboxes) for the Umm Al-Qura medical students.

Category*		Academic year					
		Second year (N=66)	Third year (N=61)	Fourth year (N=61)	Fifth year (N=56)	Sixth year (N=73)	Total (N=317)
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Symptoms	Fever and Cough	27 (40.9%)	44 (72.1%)	53 (86.9%)	47 (83.9%)	69 (94.5%)	240 (75.7%)
	SOB	25 (37.9%)	38 (62.3%)	38 (62.3%)	36 (64.3%)	56 (76.7%)	193 (60.9%)
	Diarrhea	5 (7.6%)	11 (18.0%)	18 (29.5%)	23 (41.1%)	51 (69.9%)	108 (34.1%)
	Congestion of the nose and throat	16 (24.2%)	26 (42.6%)	28 (45.9%)	29 (51.8%)	30 (41.1%)	129 (40.7%)
	Selected all correct choices together	2 (3.0%)	3 (4.9%)	7 (11.5%)	12 (21.4%)	21 (28.8%)	45 (14.2%)
	No idea	29 (43.9%)	10 (16.4%)	1 (1.6%)	7 (12.5%)	1 (1.4%)	48 (15.1%)
Source	Bats	1 (1.5%)	5 (8.2%)	8 (13.1%)	14 (25.0%)	23 (31.5%)	51 (16.1%)
	Camels	26 (39.4%)	34 (55.7%)	43 (70.5%)	43 (76.8%)	64 (87.7%)	210 (66.2%)
	All the above (correct combination)	0 (0.0%)	4 (6.6%)	5 (8.2%)	14 (25.0%)	19 (26.0%)	42 (13.2%)
	No idea	37 (56.1%)	18 (29.5%)	13 (21.3%)	13 (23.2%)	7 (9.6%)	88 (27.8%)
Transmission	Close contact with infected patients	32 (48.5%)	41 (67.2%)	44 (72.1%)	41 (73.2%)	60 (82.2%)	218 (68.8%)
	Infected animal products	28 (42.4%)	36 (59.0%)	36 (59.0%)	37 (66.1%)	52 (71.2%)	189 (59.6%)
	Through droplets (coughing and sneezing)	24 (36.4%)	39 (63.9%)	41 (67.2%)	39 (69.6%)	54 (74.0%)	197 (62.1%)
	Touching face after touching contaminated surfaces	20 (30.3%)	22 (36.1%)	29 (47.5%)	27 (48.2%)	33 (45.2%)	131 (41.3%)
	Selected all correct choices together	6 (9.1%)	13 (21.3%)	15 (24.6%)	15 (26.8%)	19 (26.0%)	68 (21.5%)
	No idea	25 (37.9%)	11 (18.0%)	2 (3.3%)	4 (7.1%)	3 (4.1%)	45 (14.2%)
Prevention	Washing hands with alcohol sanitizers	30 (45.5%)	33 (54.1%)	48 (78.7%)	43 (76.8%)	68 (93.2%)	222 (70.0%)
	Covering nose, mouth with tissue when coughing or sneezing	34 (51.5%)	47 (77.0%)	53 (86.9%)	48 (85.7%)	65 (89.0%)	247 (77.9%)
	Avoiding contact with infected patients	23 (34.8%)	31 (50.8%)	29 (47.5%)	33 (58.9%)	34 (46.6%)	150 (47.3%)
	Avoid touching eyes, nose and mouth	16 (24.2%)	17 (27.9%)	27 (44.3%)	29 (51.8%)	31 (42.5%)	120 (37.9%)
	Wearing face mask	23 (34.8%)	32 (52.5%)	37 (60.7%)	40 (71.4%)	55 (75.3%)	187 (59.0%)
	Selected all correct choices together	6 (9.1%)	10 (16.4%)	15 (24.6%)	19 (33.9%)	20 (27.4%)	70 (22.1%)
	No idea	24 (37.9%)	8 (13.1%)	3 (4.9%)	4 (7.1%)	1 (1.4%)	40 (12.6%)

		(36.4%)	(13.1%)	(4.9%)	(7.1%)	(1.4%)	(12.6%)
Treatment and Management	Supportive treatment	19 (28.8%)	38 (62.3%)	45 (73.8%)	47 (83.9%)	59 (80.8%)	208 (65.6%)
	Vaccination**	22 (33.3%)	15 (24.6%)	12 (19.7%)	10 (17.9%)	5 (6.8%)	64 (20.2%)
	Antibiotics**	10 (15.2%)	11 (18.0%)	7 (11.5%)	5 (8.9%)	7 (9.6%)	40 (12.6%)
	No idea	33 (50.0%)	10 (16.4%)	7 (11.5%)	7 (12.5%)	4 (5.5%)	61 (19.2%)

*The percentages of the responses for each category do not add up to 100% as the respondents can select more than one answer.

**Incorrect choices (the only ones in the table).

SOB, Shortness of Breath.

Figure 1:- Mean knowledge scores for each academic year towards MERS-CoV for Umm Al-Qura medical students.

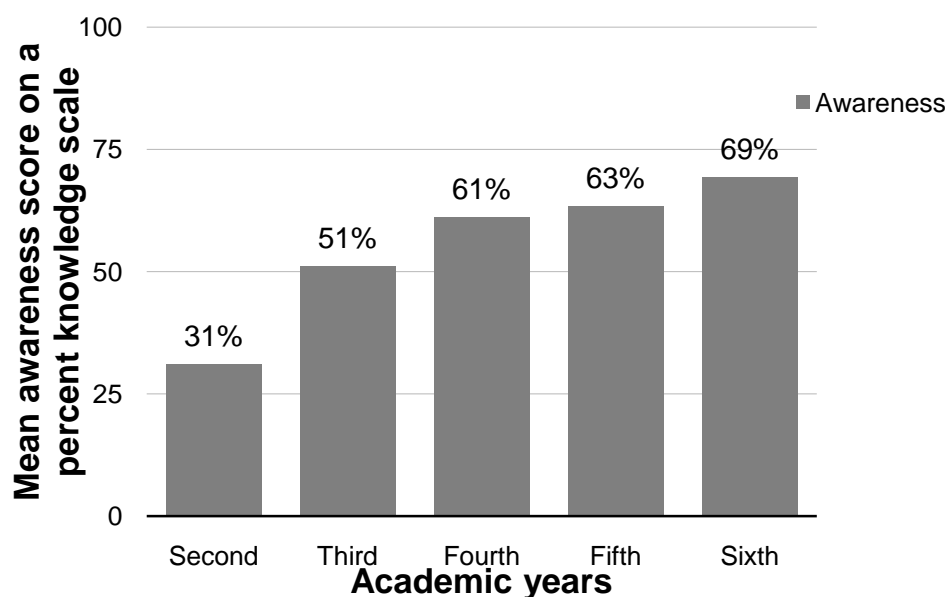


Table 4:- The correlation between the academic GPA and the awareness about MERS-CoV (considering a percent knowledge scale) for each academic year.

	Second year	Third year	Fourth year	Fifth year	Sixth year
Mean GPA (+/- SD)	83.75% (11.8%)	79.25% (11.0%)	79.5 (10.8%)	74 (13.3%)	71.25 (14.3%)
Pearson correlation (<i>r</i>)	-0.151	0.165	0.263	0.060	0.410
P value	0.231	0.219	0.041	0.665	<0.001

Conclusions and Recommendations:-

UQU Medical College students have demonstrated a moderate level of knowledge, yet the study has shed light on the poor awareness for the second and third year students. Continuous rigorous campaigns and courses by the MOH and other authorities are needed for all medical students, in particular for the second and third year students who demonstrated a relatively poor knowledge. The new curriculum that has been adopted recently by UQU Medical College needs to contain more comprehensive infection control lectures and activities, the distinguished setting of UQU underscores this need. We further recommend conducting a similar study on all the Dental, Nursing, Pharmacy, Applied Medical Sciences Colleges in Umm Al-Qura University.

Funding:-

The study has not been financially funded by any authorities.

Conflicts of interest:-

The authors have no competing interests to declare.

Acknowledgements:-

The authors would like to express their thanks duly to all participating students whom the study would not have been possible without.

References:-

1. van Doremalen N, Munster VJ. Animal models of Middle East respiratory syndrome coronavirus infection. *Antiviral research*. 2015;122:28-38.
2. Zaki AM, Van Boheemen S, Bestebroer TM, Osterhaus AD, Fouchier RA. Isolation of a novel coronavirus from a man with pneumonia in Saudi Arabia. *New England Journal of Medicine*. 2012;367(19):1814-20.
3. Bermingham A, Chand M, Brown C, Aarons E, Tong C, Langrish C, et al. Severe respiratory illness caused by a novel coronavirus, in a patient transferred to the United Kingdom from the Middle East, September 2012. *Euro Surveill*. 2012;17(40).
4. team HPAUNCI. Evidence of person-to-person transmission within a family cluster of novel coronavirus infections, United Kingdom, February 2013. *Euro surveillance: bulletin Européen sur les maladies transmissibles= European communicable disease bulletin*. 2013;18(11):20427.
5. Puzelli S, Azzi A, Santini M, Di Martino A, Facchini M, Castrucci M, et al. Investigation of an imported case of Middle East respiratory syndrome coronavirus (MERS-CoV) infection in Florence, Italy, May to June 2013. *Euro Surveill*. 2013;18(34):20564.
6. Buchholz U, Müller MA, Nitsche A, Sanewski A, Wevering N, Bauer-Balci T, et al. Contact investigation of a case of human novel coronavirus infection treated in a German hospital, October-November 2012. 2013.
7. Mailles A, Blanckaert K, Chaud P, Van der Werf S, Lina B, Caro V, et al. First cases of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) infections in France, investigations and implications for the prevention of human-to-human transmission, France, May 2013. *Middle East Respiratory Syndrome Coronavirus (MERS-CoV)*. 2013;12:19.
8. Han H-J, Yu H, Yu X-J. Evidence for zoonotic origins of Middle East respiratory syndrome coronavirus. *Journal of General Virology*. 2016;97(2):274-80.
9. <http://www.who.int/mediacentre/factsheets/mers-cov/en/>.
10. Almekhlafi GA, Albarrak MM, Mandourah Y, Hassan S, Alwan A, Abudayah A, et al. Presentation and outcome of Middle East respiratory syndrome in Saudi intensive care unit patients. *Critical Care*. 2016;20(1):1.
11. Bhatia PK, Sethi P, Gupta N, Biyani G. Middle East respiratory syndrome: A new global threat. *Indian journal of anaesthesia*. 2016;60(2):85.
12. <http://www.moh.gov.sa/en/ccc/informationcenter/pages/healthguidelines4.aspx> [5 February 2017].
13. Hoda J. Identification of information types and sources by the public for promoting awareness of Middle East respiratory syndrome coronavirus in Saudi Arabia. *Health education research*. 2016;31(1):12-23.
14. Kharm MY, Alalwani MS, Amer MF, Tarakji B, Aws G. Assessment of the awareness level of dental students toward middle east respiratory syndrome-coronavirus. *Journal of International Society of Preventive & Community Dentistry*. 2015;5(3):163.
15. Al-Mohrej A, Agha S. Are Saudi medical students aware of middle east respiratory syndrome coronavirus during an outbreak? *Journal of Infection and Public Health*. 2016.
16. ALMUTAIRI MA. AWARENESS ABOUT MIDDLE EAST RESPIRATORY SYNDROME-CORONA VIRUS (MERS-CoV) AMONG DENTAL STUDENTS IN RIYADH, SAUDI ARABIA. *Pakistan Oral & Dental Journal*. 2016;36(3).
17. Nour MO, Babalghith AO, Natto HA, Alawneh SM, Elamin FO. RAISING HEALTHCARE PROVIDERS' AWARENESS OF MERS-CoV INFECTION IN MAKKAH HOSPITALS, KSA.
18. Alnakli Z. Saudi Arabians' Health Beliefs Pertaining to Middle East Respiratory Syndrome–Coronavirus (MERS-CoV): Knowledge, Attitudes, and Practices (KAP) Assessment. 2016.
19. Al-Tawfiq JA. Middle East Respiratory Syndrome-coronavirus infection: an overview. *Journal of infection and public health*. 2013;6(5):319-22.
20. Gatrad AR, Sheikh A. Hajj: journey of a lifetime. *Student BMJ*. 2005;13.
21. Memish ZA, Zumla A, Alhakeem RF, Assiri A, Turkestani A, Al Harby KD, et al. Hajj: infectious disease surveillance and control. *The Lancet*. 2014;383(9934):2073-82.
22. Organization WoH. Middle East respiratory syndrome coronavirus (MERS-CoV) Summary of Current Situation: Literature Update and Risk Assessment. 2016, 5 December. <http://www.moh.gov.sa/en/CCC/informationcenter/pages/default.aspx> [7 February 2017].