Knowledge, Attitude and Practice (KAP) Study about Middle East Respiratory Syndrome Coronavirus (MERS-CoV) among Population in Saudi Arabia

ORIGINAL

Nouf M. Aldowyan¹, Amira S. Ahmed², Rehab M. El-Gharabawy^{2,3}

Abstract

Objectives: Middle East respiratory syndrome Coronavirus (MERS-CoV) is an epidemic in Saudi Arabia. This study aimed to measure the level of knowledge, attitude and practice about Coronavirus, to correlate the sociodemographic characteristics to the level of knowledge, attitude and practice about Coronavirus, and to explore awareness and health behaviors related to the prevention of Coronavirus.

Method: A national adaptive cross-sectional survey conducted on 714 Saudi Arabian population aged from twenty to above sixty years old in period from March to April 2017. A standardized, confidential, Internet questionnaire used for a large randomly selected population in all regions of Saudi Arabia.

Results: Out of 714 participants, women demonstrated a greater level of knowledge of MERS-CoV risk and prevention than men. Social media was the main source for providing information about MERS-CoV with (9.7%) excellent, (72.4%) fair and (17.9%) poor knowledge. Most participants had a good attitude toward privation of camel's milk and meat if they are source of transmission of MERS-CoV. However, females had better attitude toward the privation of camel's milk and meat (81.6%, $p \leq 0.001$) than males (66.7%). Regarding safety precautions, the data suggested that males were significantly less than females in taking safety precautions and prevention by 0.563 time (OR: 0.563 (0.341-0.94), $p \leq 0.05$).

Conclusion: Generally, participants have a high level of knowledge, positive attitude, and prevention practice toward MERS-CoV. Furthermore, there was no significant difference in knowledge level in

¹ Faculty of Pharmacy, Qassim University, Saudi Arabia.

² Pharmacology and Toxicology Department, Faculty of Pharmacy, Qassim University, Saudi Arabia.

³ Pharmacology and Toxicology Department, Faculty of Pharmacy, Tanta University, Egypt.

Contact information:

Amira S. Ahmed.

dr.amira2007@yahoo.com

different regions in Saudi Arabia. The females have better attitude toward MERS-CoV than males. The present study highlights the need to create wide-spread awareness about MERS-CoV infection among individuals who do not have access to the internet and social media through posters, television, and dissemination of information by healthcare professionals.

Keywords

Middle East Respiratory
Syndrome Coronavirus;
Knowledge; Attitude, Practice.

Introduction

Middle East respiratory syndrome Coronavirus (MERS-CoV) is a viral respiratory disease caused by a novel coronavirus [1]. The Coronavirus was first isolated in Saudi Arabia in 2012 [2]. It is considered an epidemic in Saudi Arabia [3]. Prevalence of the disease and mortality are higher among men compared to women. Furthermore, among people of age between 45–59 and more than 60 years have the highest mortality rate [4]. From 2012 to 21 July 2017, there have been 2,040 reported laboratory-confirmed cases and 712 deaths from MERS-CoV infection in 27 countries [5].

Knowledge of mode of disease transmission is important for developing effective control measures. The transmission of MERS-CoV is defined as sporadic between family members, often occur in health care settings, and requiring close and prolonged contact [6]. The Coronavirus infection was initially thought to spread by zoonotic events via bats. It is genetically connected to Tylonycteris bat coronavirus HKU4 (BatCoV-HKU4) [7]. However, an evidence indicates that Coronavirus originated from dromedary camels [2]. A serological study suggests that almost 90% of all camels in Africa and the Middle East were seropositive for Coronavirus, whereas other animals such as sheep, goats and cows were found to be negative [8]. A population-based seroepidemiologic study suggests that the seroprevalence of the virus was several folds higher in people who were exposed to camels compared

with that in the general population [9]. Moreover, antibodies against Coronavirus were found in samples obtained from camels in Saudi Arabia in 1993, which reinforces the hypothesis that dromedary camels are most likely the main reservoirs of Coronavirus. In contrast, no seroreactivities were reported in the blood samples obtained from abattoir workers in Saudi Arabia during 2012 [10]. The mode of transmission is still unknown but is suspected to be through saliva during direct contact with infected camels or through consumption of milk or uncooked meat. Secondary infection may occur through droplets or contact, and the virus could spread either via air or fomites [9].

A few recent studies on infected patients showed that the most common Coronavirus infection causes acute pneumonia, renal failure and almost every patient developed respiratory problems. In addition, at least one-third of the studied patients were also reported to have abdominal disorders. Also, there were other effects including inflammation of the pericardium, consumptive coagulopathy, increasing in leukocytes and neutrophils, and low levels of lymphocytes, platelets and red blood cells. Moreover, hyponatremia and low blood levels of albumin were detected during the case study [11, 12]. Coronavirus is often a lower respiratory tract disease, with the following signs and symptoms; fever with chills/rigors, cough, shortness of breath, myalgia and gastrointestinal problems (diarrhea, vomiting and abdominal pain) [13]. Abnormal fin-

dings of chest radiograph are very common in Coronavirus patients. The laboratory reports have shown thrombocytopenia, lymphopenia, and increase concentration of lactate dehydrogenase and aspartate aminotransferase [11].

The treatment includes first, the combination of ribavirin and interferon alfa-2b therapy. Second, mechanical ventilation and renal replacement therapy. However, in Saudi Arabia, five critically infected patients who received the ribavirin and interferon therapy have died [14]. The Centers for Disease Control and Prevention (CDC) stated that infected people with MERS-CoV, who do not need to be in a hospital, may be cared and isolated in their homes. The WHO recommended that individuals who are at high risk of chronic disease (such as prolonged lung disease, immunocompromised hosts, diabetes, or renal failure) should take precautions during visiting places where camels are present (such as farms, camel coops, and barn areas). These precautions include practicing good public health measures, such as good hand hygiene, avoiding direct contact with camels, avoiding drinking raw camel milk or camel urine, avoiding eating meat that has not been perfectly cooked, and avoiding eating food that may be contaminated with animal discharge or products that are not washed appropriately [15].

Health authorities in Saudi Arabia did substantial efforts in order to control the disease through various measures. Public education is considered as one of the most important measures that can help in the control of infectious diseases. Few studies were conducted in Saudi Arabia among the public and health care workers to assess knowledge about the disease and its management. Assessment of the public general knowledge about MERS-CoV is crucial for developing health policy for the containment of the disease [3, 16, 17].

The main goal of the present work was to measure the level of knowledge, attitude and practice about Coronavirus, to identify sociodemographic variables associated with satisfactory level of knowled-

ge, attitude and practice about Coronavirus, and to explore awareness and health behaviors related to the prevention of Coronavirus.

Subjects and Methods

Design of the work

A national adaptive cross-sectional survey was conducted on 714 Saudi Arabian population aged from twenty to above sixty years old in period from March to April 2017. A standardized, confidential, Internet questionnaire (an electronic questionnaire) was used for a large randomly selected population in all regions of Saudi Arabia.

Inclusion criteria

The current study involved only Saudi Arabian population aged from 20 to above 60 years old.

Questionnaire Design

The questionnaire was designed in English and then translated to Arabic and reviewed for consistency. The questionnaire included socio-demographic characteristics of the participants, questions related to knowledge about Coronavirus, and followed by questions related to attitude and prevention practice toward MERS-CoV.

Data analysis

The recorded data were analyzed using Statistical Package for Social Sciences software (SPSS) (version 20). Descriptive statistics (frequency with percentage, cross tab) were used to summarize the study and outcome variables. Pearson's Chi-square test was used to test the differences and odds ratios were used for observing and quantifying the association between categorical outcomes. The 95% confidence intervals were calculated for odds ratios. The p value ≤ 0.05 was considered significant.

Table 1. Sociodemographic Characteristics participants (n=714).

Geographic Region in Saudi Arabia												
			Qassim		Riyadh		Makkah		East province		Others	
			N=559		N=75		N=25		N=21		N=34	
Age years	N=714		Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
			N=480	N=79	N=58	N=17	N=17	N=8	N=11	N=10	N=25	N=9
20-30	N=482	N	331	57	32	11	13	6	9	6	10	7
		%	46	8	4.5	1.5	1.8	0.8	1.2	0.8	1.4	0.9
31-40	N=121	N	86	9	8	2	1	1	2	Nil	11	1
		%	12	1.2	1.1	0.2	0.1	0.1	0.2		1.5	0.1
41-50	N=84	N	4	10	13	2	1	Nil	Nil	2	4	Nil
		%	0.5	1.4	1.8	0.2	0.1			0.2	0.5	
51-60	N=26	N	59	3	5	1	2	1	Nil	2	Nil	1
		%	8.2	0.4	0.7	0.1	0.2	0.1		0.2		0.1
>60	N=1	N	Nil	Nil	Nil	1	Nil	Nil	Nil	Nil	Nil	
		%				0.1						Nil

The results are expressed as percentages (%). N: number of participants.

Results

Table 1 summarizes the Sociodemographic characteristics of the respondents. The vast majority of the participants were females (n=591; 82.8%) between the age from 20 to 30 years old. The least frequent age group was >60 years with 1 (0.1%) respondent. The following regions in Saudi Arabia contributed to the survey; central region "Qassim" (559; 78.3%), "Riyadh" (75; 10.5%), Western region "Makkah" (25; 3.5%), "eastern region" (21; 3%) and other regions (34; 4.8%).

Table 2 showed sociodemographic data including marital status, level of education, occupation and level of income. Four hundred twenty-three (59%) were married and 291 (41%) were single. Majority of participants had a bachelor 570 (79.8%), and 34 (4.7%) had higher education (master and PhD degree). In addition, 309 (43%) were student, and 48 (6.7%) were working in the medical field.

The knowledge section in the survey intended to focus on the perception of the participants about MERS-CoV (general knowledge about MERS-CoV, its etiology, symptoms, transmission mode, treatment and prevention of MERS-CoV) according to the geographic regions as shown in **Table 3** and **4**.

Table 2. Socio-demographic characteristics of participants (n=714).

Characteristic	F	%
Marital status:		
Married	423	59
Single	291	41
Educational level		
Primary	4	0.6
Intermediate	9	1.3
Secondary	97	13.6
Bachelor	570	79.8
Higher education	34	4.7
Occupation		
Student	309	43
Medical field	48	6.7
Close contact with animals	2	0.3
Don't work	122	17.1
Other	233	32.9
Level of income per month		
1000-3000 SR	315	44
4000-6000 SR	72	10
7000-9000 SR	98	14
10000-20000 SR	171	24
>20000	28	8

The results are expressed as percentages (%). F: Frequency.

Table 3. Knowledge about MERS-CoV according to Geographic Regions.

Geographic Region in Saudi Arabia																		P- value	
			Qassim			Riyadh			Makkah			East province			Others				
			N=559			N=75			N=25			N=21			N=34				
			Yes	No	Not sure	Yes	No	Not sure	Yes	No	Not sure	Yes	No	Not sure	Yes	No	Not sure		
General knowledge	Do you hear about MERS-CoV?	No.	556	3	NiL	74	1	NiL	25	NiL	NiL	21	NiL	NiL	35	NiL	NiL	0.863	
		%	99.5	0.5		98.7	1.3		100			100			100				
	Do you infected by MERS-CoV?	No.	3	556	NiL	1	74	NiL	NiL	25	NiL	NiL	21	NiL	1	33	NiL	0.501	
		%	0.5	99.5		1.3	98.7		100			100			2.9	97.1			
	Did one of your family or relatives or friends infected by MERS-CoV?	No.	93	466	NiL	12	63	NiL	11	14	NiL	4	17	NiL	2	32	NiL	0.003*	
		%	16.6	83.4		16	84		44	56		19	81		5.9	94.1			
	Is MERS-CoV contagious?	No.	519	4	36	65	2	8	25	NiL	NiL	18	NiL	3	29	1	4	0.406	
		%	92.8	0.8	6.4	86.6	2.7	10.7	100			85.7			14.3	85.3	2.9		11.8
Are there any animal/poultry farms, stores, markets, zoos near your household?			No.	92	467	NiL	8	67	NiL	6	19	NiL	2	19	NiL	3	31	NiL	0.279
			%	16.5	83.5		10.7	89.3			24		76	9.5		90.5			
Source Of MERS-CoV	Do you think that infection increase in Hajj and Omrah?	No.	360	37	162	50	5	20	17	NiL	8	13	1	7	24	1	9	0.915	
		%	64.4	6.6	28.9	66.6	6.7	26.7	68		32	61.9	4.8	33.3	70.6	2.9	26.5		
Detection and treatment	Is there a treatment for MERS-CoV?	No.	240	104	215	36	12	27	11	8	6	10	3	8	15	9	10	0.583	
		%	42.9	18.6	38.4	48	16	36	44	32	24	47.6	14.2	38.1	44.1	26.5	29.4		
	Do you think the early diagnosis improves the treatment?	No.	501	11	47	65	3	7	23	1	1	19	1	1	30	1	3	0.950	
		%	89.6	2	8.4	86.7	4	9.3	92	4	4	90.4	4.8	4.8	88.3	2.9	8.6		
	Do you think the isolation of the suspected cases at emergency department is important?	No.	521	6	32	66	1	8	24	NiL	1	15	2	4	28	NiL	6	0.003*	
		%	93.2	1.1	5.7	88	1.3	10.7	96		4	72.4	9.5	19	82.9		17.1		
	Do you think that the MERS-CoV can be treated at home?	No.	40	416	97	12	36	27	5	14	6	3	10	8	4	18	12	0.000#	
		%	8.3	74.4	17.3	16	48	36	20	56	24	14.3	47.6	38.1	11.8	53	35.3		
	Is there a vaccine for MERS-CoV?	No.	151	160	248	36	17	22	5	10	10	8	1	12	9	10	15	0.302	
%		27.6	28	44.4	48	22.7	29.3	20	40	40	38.1	4.8	57.1	26.5	29.4	44.1			
Can infection be prevented by seasonal influenza vaccine?	No.	60	191	308	13	25	37	3	11	11	1	7	13	4	8	22	0.488		
	%	10.7	34.2	55.1	17.3	33.4	49.3	12	44	44	4.8	33.3	61.9	11.8	23.5	64.7			
Do you think that health education can help to prevent the disease?	No.	529	10	20	70	2	3	24	NiL	1	20	1	NiL	32	NiL	2	0.890		
	%	94.6	1.8	3.6	93.3	2.7	4	96		4	95.2	4.8		94.1		5.9			
The results are expressed as percentages (%). *: Result is significant at p ≤ 0.01. #:Result is significant at p ≤ 0.001																			

Table 4. Participants perception about causes, mode of transmission, symptoms, risk factors, treatment and prevention measures of MERS-CoV according to geographic region.

Geographic Region in Saudi Arabia											
	Qassim		Riyadh		Makkah		East		Others		P-value
	N=559		N=75		N=25		N=21		N=34		
	N	%	N	%	N	%	N	%	N	%	
Which of the following is the cause of MERS-CoV?											
Bacteria	25	4.5	3	4	0		2	9.5	1	3	0.559
Virus	440	78.7	53	70.6	20	80	17	81	28	82.3	
Fungus	3	0.5	1	1.3	0		0		0		
Immunodeficiency	15	2.7	1	1.3	3	12	0		1	3	
I don't know	76	13.5	7	9.3	2	8	2	9.5	4	11.7	
Which of the following is (are) the mode(s) of transmission of MERS-CoV?											
Direct transmission during coughing	49	8.7	10	13.3	3	12	1	4.7	1	3	0.054
Touching surfaces contaminated with the virus	15	2.7	7	9.3	0		1	4.7	2	5.8	
Through infected camel and bats	43	7.6	5	6.7	3	12	2	9.5	4	11.7	
By consuming milk and meat of infected animals	7	1.2	1	1.3	0		0		0		
Direct contact with an infected patient	26	4.6	2	2.7	1	4	1	4.7	0		
All of above	373	66.7	43	57.3	15	60	16	76.2	24	70.6	
Others	2	0.4	3	4	1	4	0		2	5.8	
Unsure	44	7.8	3	4	2	8	0		1	3	
Which of the following is (are) symptom(s) of MERS-CoV?											
High temp.	44	7.9	4	5.3	2	8	2	9.5	4	11.7	0.031*
Cough, sore throat, blocked nose	35	6.3	4	5.3	0		3	14.3	1	3	
Difficulty of breathing	8	1.4	0		0		2	9.5	1	3	
All of above	430	76.9	62	82.7	21	84	14	66.7	23	67.6	
Others	2	0.4	1	1.3	0		0		2	5.8	
Unsure	40	7.1	4	5.3	2	8	0		3	8.8	
Symptoms appear after which of the following?											
<2 days of infection	15	2.7	6	8	2	8	0		0		0.421
2 – 5 days	127	22.6	13	17.3	2	8	5	23.8	7	20.6	
2 – 14 days	100	17.8)	14	18.7	5	20	6	28.6	8	23.5	
Unsure	139	24.8	22	29.3	9	36	5	23.8	10	29.4	
I don't know	178	31.7	20	26.7	7	28	5	23.8	9	26.5	
Which of the following is (are) the risk factor(s) of MERS-CoV ?											
Being old egad	7	1.2	1	1.3	0		0		1	3	0.825
Individuals with cancer, chronic respiratory, diabetes	17	3	3	4	2	8	0		1	3	
Having awakened immune system	111	19.8	13	17.3	5	20	5	23.8	4	11.7	
Traveling to parts of the world known to harbor the virus	3	0.5	0		0		1	4.7	0		
Pregnant women	52	9.3	4	5.3	2	8	1	4.7	3	8.8	
All of above	271	48.4	44	58.7	11	44	9	43	17	50	
Unsure	98	17.7	10	13.3	5	20	5	23.8	8	23.5	

Geographic Region in Saudi Arabia											
	Qassim		Riyadh		Makkah		East		Others		P-value
	N=559		N=75		N=25		N=21		N=34		
	N	%	N	%	N	%	N	%	N	%	
Which of the following describes MERS-CoV treatment?											
Supportive treatment	137	24.4	30	40	6	24	7	33.3	10	29.4	0.094
Vaccination	176	31.4	23	30.7	7	28	6	28.5	9	26.5	
Unsure	120	21.4	6	8	6	24	4	19.1	3	8.8	
I don't know	126	22.5	16	21.3	6	24	4	19.1	12	35.3	
Which of the following is (are) prevention measure(s) of coronavirus?											
Wash hands with water and soap	12	2.1	2	2.7	0		1	4.7	2	5.8	0.891
Avoid touching the eyes, nose with hands	4	0.7	1	1.3	0		0		0		
Avoid contacts with infected people	27	4.8	3	4	2	8	3	14.3	1	3	
Pay attention to other health habits	14	2.5	2	2.7	0		0		1	3	
All of above	502	89.8	67	89.3	23	92	17	81	30	88.2	
The results are expressed as percentages (%). N: number of participants. *:Result is significant at p ≤ 0.05.											

It was found that the majority of respondents (98%) had prior knowledge about MERS-CoV. High proportion of respondents (78.7%) knew that the causative agent was a virus. More than 85% of the respondents in Qassim region knew that the MERS-CoV is contagious. Only 0.5%, 1.3% and 2.9% of the participants had experienced MERS-CoV infection in Qassim, Riyadh and other region in Saudi Arabia, respectively. In addition, the respondents' relatives in Makkah region had significant infection level (44%, $p \leq 0.01$) in comparison to other geographic region in Saudi Arabia. This percentage was less in other regions; 16%, 17% and 19% in Riyadh, Qassim and east province, respectively. On comparing the Knowledge about the importance of isolation of suspected cases, the participants in Makkah region showed significantly more awareness than other regions (96%, $p \leq 0.01$). On the other hand, more than 45% of respondents affirmed that MERS-CoV can't be treated at home.

It was found that more than 70% of the respondents knew that there were more than one symptoms of MERS-CoV, followed by one sign as fever (7.9%), Cough, sore throat and blocked nose (6.3%), and difficulty breathing (1.4%) in the Qassim region. However, there was a significant awareness about

MERS-Cov symptoms in Makkah region (84%, $p \leq 0.05$) compared to other Saudi Arabia regions.

Participants from Qassim region (66.7%) and East province (76.2%) reported that there was more than one way of MERS-CoV transmission. This includes coughing, touching contaminated surfaces, infected camel and bats, consuming milk and meat of infected animals and direct contact with an infected patient. Other regions in Saudi Arabia had similar knowledge about the mode of transmission. Around 60% of participant believed that Hajj and Omrah are source of MERS-Cov transmission.

Of all the participants, more than 80 % knew that the disease is prevented through wash hands, and avoid touching and contacting infected people. Regarding the knowledge of disease treatment, the fact that the disease has no specific treatment was known by only 18.6%, 16%, 32%, and 14.2% in Qassim, Riyadh, Makkah, east province, respectively. Around 40% of participants confirmed that there is a treatment for the disease. In addition, more than 85% believed that early detection, and health education could help in preventing MERS-CoV. Around 74% ($P \leq 0.001$) of participants in Qassim region believed that there is no current treatment for MERS-CoV at home. Regarding va-

ccine, about 48% of Riyadh region participants believed in the presence of vaccine to prevent MERS-CoV, however 40% of Makkah city participants believed there was no vaccine to prevent the disease. Supportive treatment and vaccination were described as a treatment for MERS-CoV by most participants in all regions. For example, 40% and 30.7% of participants in Riyadh region believed that supportive treatment and vaccination could help in treatment, respectively. On the other hand, it is worth mentioning that in general, there was no significant association between knowledge and geographic regions.

Figure 1 shows the association between different sources of information about MERS-CoV and the

Figure 1: Association between information sources and the level of participant's knowledge about MERS-CoV.

Table 5. Attitude toward MERS-CoV according to gender.

		Female N=591			Male N=123			P Value
		Yes	No	Not sure	Yes	No	Not sure	
Do you think that the disease is dangerous?	No.	425	56	110	87	20	16	0.042*
	%	71.9	9.5	18.6	70.7	16.3	13	
Are you worried about one of your family members can get infection?	No.	426	126	42	86	28	6	0.655
	%	71.7	23.3	7.1	71.1	23.3	5	
Are you afraid to go to common places in order to avoid infection?	No.	111	426	58	28	88	5	0.097
	%	18.7	71.6	9.7	23.1	72.7	4.1	
If you take precautions, can the MERS-CoV infection be prevented?	No.	538	5	48	106	5	12	0.097
	%	91	0.8	8.2	86.1	4.1	9.8	
Should you know information about MERS-CoV?	No.	461	76	55	88	26	7	0.030*
	%	77.9	12.8	9.3	72.7	21.5	5.8	
If you know that the camels are sources for the transmission of MERS-CoV, would you consume camels' milk or meat?	No.	63	482	47	29	81	12	0.000#
	%	10.6	81.6	8	23.6	66.7	9.8	
If there is a vaccine, would you take it?	No.	448	71	76	94	15	12	0.683
	%	75.3	11.9	12.8	77.7	12.4	9.9	
Can MERS-CoV about infection be cured ?	No.	393	24	178	88	5	28	0.321
	%	66.1	4	29.9	72.7	4.1	23.1	
Is the available information about MERS-CoV in Saudi Society sufficient?	No.	142	316	133	31	71	21	0.343
	%	24	53.5	22.5	25.2	57.7	19	
Are the protective measures sufficient for prevention?	No.	184	241	167	38	57	25	0.210
	%	31.1	40.7	28.2	31.7	47.5	20.8	
Is there negative effect of infection on KSA economy?	No.	340	81	172	72	25	23	0.029*
	%	57.3	31.7	29	60	20.8	19.2	
Does the government institutions able to control the epidemic?	No.	240	114	240	63	28	30	0.005**
	%	40.4	19.2	40.4	52.1	23.1	24.8	

The results are expressed as percentages (%). N: number of participants. *:Result is significant at $p \leq 0.05$.

**.: Result is significant at $p \leq 0.01$. #: Result is significant at $p \leq 0.001$.

level of participants' knowledge about MERS-CoV. Social media was the main source for providing information about MERS-CoV with (9.7%) excellent, (72.4%) fair and (17.9%) poor knowledge.

As shown in **Table 5**, several themes gained agreement amongst the participants. About 72.5% of male and 71.4% of female participants agreed that MERS-CoV is a dangerous disease. Around 71% of participants were afraid from someone of the families could possibly get infected. However, only 19% of males and 23% of females were afraid from going to common places.

There was almost unanimous among participants that MERS-CoV infection is preventable. By comparing males and females, the females (91%, $P \leq 0.05$) showed significantly better attitude toward the possibility of preventing of MERS-CoV infection than males (86.1%).

In addition, most participants had good attitude toward privation of camel's milk and meat if they are source of transmission of MERS-CoV. However, women had better attitude towards the privation of camel's milk and meat if they are source of transmission of MERS-CoV infection (81.6%, $p \leq 0.001$) than men (66.7%).

About half of both females (54%) and males (58%) respondents felt that the information in Sau-

di Society was insufficient to deal with MERS-CoV. Around 40% of females and 52% of males agreed that governmental institutions can control and prevent the disease.

Regarding whether participants consider themselves at risk of infection, males thought that they are at risk more than females by about 1.3 times [OR:1.3 (0.78-2.13)]. Additionally, males are less likely to visit that doctor compared to females by 0.57 time [OR:0.57(0.306-1.098)]. Regarding safety precautions, the data suggested that males are significantly less than females in taking safety precautions and prevention by 0.563 time [OR: 0.563 (0.341-0.94), $p \leq 0.05$] as illustrated in **Table 6**. In general, female participants had better attitude toward MERS-CoV compared to male participants.

As illustrated in **Table 7**, 74.6% of females and 78% of males take several precautions such as washing hands, avoiding touching the eyes, nose and mouth, throwing the used tissue in the trash, and using the mask to cover their nose in crowded places to avoid infection. In addition, the physician advising is the main reason for getting the vaccine (if preset) by males (59.3%) and females (34.5%) to prevent the MERS-CoV infection.

Table 6. Attitude towards MERS-CoV according to gender.

		Female		Male		P Value	OR	
		N=591		N=123			N	95% CI
		Yes	No	Yes	No			
Do you think yourself at risk?	No.	98	493	27	96	0.305	1.297	0.78-2.13
	%	16.6	83.8	20.9	80			
If you have one of the symptoms of the disease do you go to the Doctor?	No.	549	42	106	17	0.091	0.57	0.306-1.098
	%	92.9	7.1	88.3	13.8			
If you have flu symptoms, do you avoid normal activities?	No.	380	211	76	47	0.737	0.933	0.622-1.399
	%	64.3	82.4	16.6	38.2			
Do you a void contact with infected case?	No.	560	32	115	6	0.842	1.095	0.448-2.680
	%	94.6	5.4	95	5			
Do you take safety precautions and prevention?	No.	515	76	96	27	0.024*	0.563	0.341-0.93
	%	87.2	12.8	79.3	21.9			

The results are expressed as percentages (%). OR: odd ratio. CI: confidence interval. *: Result is significant at $p \leq 0.05$.

Table 7. Practice of taking precaution and vaccination (if preset) to prevent the MERS-CoV infection.

	Female		Male		P-value
	N=591		N=123		
	N	%	N	%	
Which of the following precautions do you take to prevent Coronavirus infection?					
I wash hands often.	68	11.5	15	12.2	0.339
I avoid touching the eyes, nose and mouth.	30	5	4	3.3	
I throw the tissue in the trash after I use.	31	5.2	5	4.1	
I use masking to cover my nose in crowded places.	21	3.6	3	2.4	
All of the above.	441	74.6	96	78	
Which of the following is the reason for getting vaccination (if present)?					
Required for my job.	153	25.9	17	13.8	0.149
My family doctor advised me to do it.	204	34.5	73	59.3	
Because of my age.	52	8.8	6	4.9	
It is free	182	30.8	27	22	
The results are expressed as percentages (%). N: number of participants					

The results are expressed as percentages (%). N: number of participants

Discussion

Little studies were conducted in Saudi Arabia among the public and health care workers to assess their knowledge about MERS-CoV and its management. The survey of the present study is inclusive as it includes the evaluation of the participants' knowledge, attitude and practice about modes of transmission, clinical symptoms, risk factors, preventive measures and treatment of MERS-CoV.

The distribution of the sociodemographic characteristics of the respondents showed a high percentage of females, Bachelor and married participants. Nearly 20% of the participants did not exactly know that the causative agent of the disease is a virus. Knowledge of the etiology of the disease is considered as the first step of patient education. Once the people know the cause, they are most likely understanding how the disease is transmitted and what are the preventive measures that limit its distribution.

The current study measured public awareness about MERS-CoV in Saudi Arabia and showed that methods of delivering information and educating people need to take into account geographic loca-

tion to promote health. In addition, the majority of participants depended on the social media as main source of information about MERS-CoV. However, these result different from those of previous studies, which showed television as a main source of information for participants [3]. On the other hand, about half of the respondents adopted the insufficient of the information about MERS-CoV in Saudi society.

The result from the present study was expected because most of the educational materials (e.g., brochures) are posted online by the Ministry of Health (MOH), which encourages the public to use technology. However, caution must be taken when using the social media as a main source of information due to information overload and it is difficult to determine the validity of information sources, which leads to misinformation. Therefore, evaluation skills should be developed among the public with regard to carefully evaluating MERS-CoV related educational materials [2].

The current study comes in agreement with the work of Almutairi et al., (2015) who stated that a vast majority of the participants were aware of

the MERS-CoV in Saudi Arabia [3]. Furthermore, females had more knowledge and better attitude than males. This study also showed a positive attitude and a higher level of proper hygienic practices among the population. These current results are in line with other studies' findings which showed a positive attitude of the public and among healthcare professionals specifically [3, 16].

Participants in Qassim (66.7%) and East province (76.2%) reported that camel is one of the sources of MERS-CoV transmission. This is due to the isolation of MERS-CoV from camels in Egypt, Qatar, and Saudi Arabia, which lead to the thinking about camels as being a source of infection of the coronavirus [14]. Moreover, more than 67% of the respondents reported the humans themselves could act as a source of transmission of this disease by connecting with an infected patient, touching surfaces contaminated with virus and cough, confirming the good knowledge level about mode of transmission of MERS-CoV infection among population in Saudi Arabia. However, preventing the infection transmission should be increase by people education about the different mode of transmission of MERS-CoV. The most identified gap in knowledge among participants was related to disease treatment domain. Only 19% of participants believed that there is no treatment for MERS-CoV; however, (26.6%) agreed with using supportive treatment for MERS-CoV, and (31.1%) of the participants believed in the presence of a vaccine for preventing MERS-CoV. Actually, there is no treatment, and the infected people treatment depended on their immune system. As well as their psychology, according to a manager of public health at Ohud Hospital in Madinah (western region). He also added that MERS-Cov patients still beg for treatment, so the hospital just gives them ribavirin and interferon. They feel better because they think that it is a legitimate treatment, but it is really just a mindfulness-based treatment designed to improve their health and keep their hopes up.

The strength of the immune system is important in overcoming MERS-CoV [16].

Generally, most participants had positive attitude toward the privation of consuming camels' meat or milk if they are source of MERS-CoV infection. Furthermore, there is no study that proves that the MERS-CoV is transmitted to humans by consuming the milk or meat of camels, but prevention is better than cure.

It was found that more than 75% of respondent knew that there are many symptoms of MERS-Cov such as fever, cough, sore throat and blocked nose. This result shows that participants had a good knowledge about the symptoms of the disease. The majority of respondents (91.6%) agreed that the infected patients with MERS-Cov should be isolated. In addition, more than 70% of participants worried about infection of their family by MERS-CoV. All of these reflect the high concern about MERS-CoV infection.

In conclusion, Generally, participants have a high level of knowledge, positive attitude, and prevention practice toward MERS-CoV. Furthermore, there was no significant difference in knowledge level in different regions in Saudi Arabia. The females have better attitude toward MERS-CoV than males. The present study highlights the need to create wide-spread awareness about MERS-CoV infection among individuals who do not have access to the internet and social media through posters, television, and dissemination of information by healthcare professionals.

References

1. Zumla A., Hui D.S. and Perlman S., 2015. Middle East Respiratory Syndrome. *Lancet*, 386: 995-1007.
2. Zaki A.M., van Boheemen S., Bestebroer T.M., Osterhaus A.D. and Fouchier R.A., 2012. Isolation of a novel coronavirus from a man with pneumonia in Saudi Arabia. *N Engl J Med*, 367:1814-1820.

3. Almutairi K.M., AlHelih E.M., Moussa M., Boshaiqah A.E., Alajilan A.S., Vinluan J.M. and Almutairi A., 2015. Awareness, attitudes, and practices related to coronavirus pandemic among public in Saudi Arabia. *Family & Community Health*, 38: 332-340.
4. Assiri A., McGeer A., Perl T.M., Price C.S., Al Rabeeah A.A., Cummings D.A. and Memish Z.A., 2013. Hospital outbreak of Middle East respiratory syndrome coronavirus. *New England Journal of Medicine*, 369: 407-416.
5. Plipat T., Buathong R., Wacharapluesadee S., Siriarayapon P., Pittayawonganon C., Sangsajja C., Kaewpom T., Petcharat S., Ponpinit T., Jumpasri J., Joyjinda Y., Rodpan A., Ghai S., Jittmittraphap A., Khongwicht S., Smith D.R., Corman V.M., Drosten C. and Hemachudha T., 2017. Imported case of Middle East respiratory syndrome coronavirus (MERS-CoV) infection from Oman to Thailand, June 2015. *Euro Surveill.*, 22: 30598.
6. Mackay I.M. and Arden K.E., 2015. MERS coronavirus: diagnostics, epidemiology and transmission. *Virology Journal*, 12: 222.
7. Durai P., Batool M., Shah M. and Choi S., 2015. Middle East respiratory syndrome coronavirus: transmission, virology and therapeutic targeting to aid in outbreak control. *Exp Mol Med.*, 47: e181.
8. Milne-Price S., Miazgowicz K.L. and Munster V.J., 2014. The emergence of the Middle East respiratory syndrome coronavirus. *Pathog Dis.*, 71: 121-136.
9. Kayali G. and Peiris M. A more detailed picture of the epidemiology of Middle East respiratory syndrome coronavirus. *The lancet*, 15: 495-497.
10. Memish Z.A., Cotten M., Meyer B., Watson S.J., Alsaifi A.J., Al Rabeeah A.A., Corman V.M., Sieberg A., Makhdoom H.Q., Assiri A., Al Masri M., Aldabbagh S., Bosch B.J., Beer M., Müller M.A., Kellam P. and Drosten C., 2014. Human infection with MERS coronavirus after exposure to infected camels, Saudi Arabia, 2013. *Emerg Infect Dis.*, 20: 1012-1015.
11. Guery B., Poissy J., el Mansouf L., Séjourné C., Ettahar N., Lemaire X., Vuotto F., Goffard A., Behillil S., Enouf V., Caro V., Mailles A., Che D., Manuguerra J.C., Mathieu D., Fontanet A. and van der Werf S., 2013. Clinical features and viral diagnosis of two cases of infection with Middle East Respiratory Syndrome coronavirus: a report of nosocomial transmission. *Lancet*, 381: 2265-2272.
12. Jiang S., Lu L., Du L. and Debnath A.K., 2013. A predicted receptor-binding and critical neutralizing domain in S protein of the novel human coronavirus HCoV-EMC. *J Infect.*, 66: 464-466.
13. Assiri A., Al-Tawfiq J.A., Al-Rabeeah A.A., Al-Rabiah F.A., Al-Hajjar S., Al-Barrak A., Fletman H., Al-Nassir W.N., Balkhy H.H., Al-Hakeem R.F., Makhdoom H.Q., Zumla A.I. and Memish Z.A., 2013. Epidemiological, demographic, and clinical characteristics of 47 cases of Middle East respiratory syndrome coronavirus disease from Saudi Arabia: a descriptive study. *Lancet Infect Dis.*, 13: 752-761.
14. Sampathkumar P., 2014. Middle East respiratory syndrome: What clinicians need to know. *Mayo Clin Proc.*, 89: 1153-1158.
15. Kharma M.Y., Alalwani M.S., Amer M.F., Tarakji B. and Aws G., 2015. Assessment of the awareness level of dental students toward Middle East respiratory syndrome-coronavirus. *J Int Soc Prev Community Dent.*, 5: 163-169.
16. Khan M.U., Shah S., Ahmad A. and Fatokun O., 2014. Knowledge and attitude of healthcare workers about middle east respiratory syndrome in multispecialty hospitals of Qassim, Saudi Arabia. *BMC Public Health*, 14:1281.
17. Nour M.O., Babilghith A.O., Natto H.A., Al-Amin F.O. and Alawneh S.M., 2015. Knowledge, attitude and practices of healthcare providers towards MERS-CoV infection at Makkah hospitals, KSA. *International Research Journal of Medicine and Medical Sciences*, 3:103-112.

Publish in International Archives of Medicine

International Archives of Medicine is an open access journal publishing articles encompassing all aspects of medical science and clinical practice. IAM is considered a megajournal with independent sections on all areas of medicine. IAM is a really international journal with authors and board members from all around the world. The journal is widely indexed and classified Q2 in category Medicine.