Research Article

Knowledge, attitude, and practice toward MERS-CoV among primary health-care workers in Makkah Al-Mukarramah: an intervention study

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Abstract

Background: Saudi Arabia (KSA) showed a higher number of Middle East respiratory syndrome—coronavirus (MERS-CoV) infection in Eastern Mediterranean Region. Satisfactory knowledge, positive attitude, and healthful practice of health-care workers (HCWs) regarding MERS-CoV are a cornerstone in prevention of virus spread and disease outbreak.

Objective: To assess and improve knowledge, attitude, and practice (KAP) of HCWs toward MERS-CoV.

Materials and Methods: An interventional prospective study was conducted during the year 2015 on a randomly selected 398 HCWs in primary health-care centers of Makkah Al-Mukarramah, KSA. The participants were invited after their consent to fill a predesigned closed-ended Arabic-based questionnaire before and 3 months after exposure to a structured health education program.

Result: The level of satisfactory knowledge, positive attitude, and good practice of studied HCWs significantly improved after exposure to the program, as it increased from 43.3%, 45%, and 57.4% before intervention to 67.9%, 63.8%, and 64.8% after intervention, respectively ($P < 0.001$). Older age, previous training, and experience were positively correlated with higher scores of knowledge.

Conclusion: The study reflected the importance of health education as a cornerstone element in improving KAP toward MERS-CoV infection in preventing the virus spread and disease outbreak.

KEY WORDS: MERS-CoV, prevalence, outbreak, knowledge, attitude and practice, health-care workers

Introduction

Middle East respiratory syndrome—coronavirus (MERS-CoV) is the causative agent of severe respiratory disease in human. It was first reported in 2012, when a new β coronavirus was isolated from a Saudi Arabian patient in Jeddah who succumbed owing to severe pneumonia and multiple organ failure.[1] Virus genome sequencing demonstrated that the virus belonged to lineage C of the genus β-coronavirus and was phylogenetically related to the bat coronaviruses HKU4 and HKU5, which were discovered in lesser bamboo and Japanese Pipistrelle bats in Hong Kong.[2] In a study performed in Europe , Africa, and Asia , including the Middle East showed that an RNA coronavirus are identified often in bat fecal sample with a sequence closely resembling MERS-CoV.[3–5] In a study in Saudi Arabia, which revealed isolation of MERS-CoV from a man with deadly infection, the full-genome sequencing demonstrated that the virus isolated from the man and his camel were identical.[6] Health-care settings were related to human-to-human transmission in over an half of all laboratory-confirmed secondary cases.[7] Outbreak of sever acute respiratory syndrome coronavirus (SARS-CoV) infection in 2003 and the MERS in 2012 showed that these viruses can cause fatal human disease (death rates were 11% and 43%, respectively).[8,9] In a study of 47 patients with MERS-CoV infection in Saudi Arabia, 45 (96%) showed underlying comorbidities, including diabetes

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mellitus (68%), hypertension (34%), chronic cardiac disease (28%), and chronic kidney disease (49%).[10] The median incubation period for the disease in the outbreak of MERS-CoV in Saudi Arabia that resulted in laboratory-confirmed MERS-CoV in 23 individuals was 5.9 days (95%CI: 1.9–14.7 days).[11] The outcome of MERS-CoV in Saudi Arabia since 2012 until December 31, 2015, was 0.2% (3) active cases under treatment, 43% (551) died, 56.8% (729) recovered, and the classification based on source of infection was 39% primary, 33% health-care acquired (patients), 14% household contact, 12% health-care acquired (worker), and 3% unclassified.

Objective

The main objective was prevention of MERS-CoV infections in primary health-care facilities. However, the specific objectives were to assess and improve knowledge, attitude, and practice (KAP) of primary health-care worker (HCW) toward MERS-CoV.

Materials and Methods

Type, Time, Site, and Population of the Study

This work was a prospective interventional study conducted during the year 2015 among primary HCWs in Makkah Al-Mukarramah, KSA.

Sampling Technique

The sample size was calculated (at 90% power of the study, 95% confidence level, and 5% level of significance) as 378, which was increased to 400 to overcome dropping out or invalid response. They were selected by a systematic random sampling technique from a list as every third person. Only 398 participants completed the study.

Tools of the Study

1. A closed-ended Arabic questionnaire was designed to collect information about: (A) personal data, e.g., age, sex, and so on; (B) socioeconomic status, classified to high, middle, or low according to socioeconomic scoring system of Abd Al-Twab[5]; (C) source of information about MERS-CoV; (D) knowledge toward MERS-CoV, e.g., causative agents, mode of transmission and so on; (E) attitude, e.g., If he is worried from getting infection, afraid from complications, and so on; (F) behaviors regarding infection control as regard washing hands, covering nose and mouth during coughing or sneezing, and so on. The same questionnaire was used as a pre- and posttest, before and 3 months after implementation of the health education program.
2. **Health education program**
   - **Aim of the program:** The program was implemented to improve knowledge, modify the attitude, and correct the practice of the participants regarding MERS-CoV.
   - **Program implementation:** All the selected participants were first interviewed in the break where the study methodology and objectives were simply discussed to obtain their consent. They were subjected to a previously designed questionnaire to assess their KAP toward MERS-CoV. Then, they were given an appointment to attend the health education program.
   - **Sessions place and time schedule:** The program was held every other day for 2 weeks.
   - **Main topics of the program:** The participants were given intensive theoretical course about MERS-CoV with special emphasis on causative agent, mode of transmission, clinical picture, complications, prevention, and management.
   - **Teaching methods:** The program was presented as lectures, role-play, and group discussion.
   - **Teaching aids:** Photographs, posters, pamphlets, and data show.
   - **Evaluation of the program:** The program was evaluated 3 months later on by posttest using the same pretest questionnaire.

Ethical Issues

The program was ethically offered to nonparticipant HCWs at the end of the study.

Statistical Analysis

The results were collected, tabulated, and statistically analyzed by a personal computer using SPSS software program (Statistical Program for Social Science), version14, under Windows XP. Quantitative data were expressed as mean and standard deviation. Qualitative data were expressed as number and percentage. To assess the differences in frequencies on the dichotomized qualitative variables (scored present or absent), c^2 was used with 5% level of significance. Odds ratio using logistic regression analysis described the probability that people who are exposed to a certain factor will have high KAP compared to people who are not exposed to that factor. *Z* test (*z*) was used to study the association between two qualitative variables within different groups in pre- and posttests.

Results

Regarding the knowledge of the participants, it was satisfactory only in 42.7%, which improved postintervention to 68.8%. Regarding to the HCWs' attitude, it was positive only in 44.5% and increased after program exposure to 64.8%. Logistic regression analysis of the association between sociodemographic criteria and knowledge scores of the participants showed that age and type of job exhibited the most effect on their knowledge, where 57.6% of participants >40 years old showed satisfactory knowledge compared with 42.4% in of participants <40 years old. However, the previous training of participants did not significantly affect their knowledge; it was almost the same as it was 49.4% and 50.6% in both [Tables 1–6].

Table 1: Sociodemographic characteristics of the studied participants (*N* = 398)

	N	%
Age (mean ±SD), years: 35.80 ± 13.92		
Sex		
Male	174	43.7
Female	224	56.3
Residence		
Urban	211	53.1
Rural	187	46.9

Discussion

This study addresses a major health problem among HCWs in Saudi Arabia. Educational programs conducted on health-care providers was effective butting in consideration the attitudes of local community when planning health education in communities with MERS-CoV. Unfortunately, there are no similar interventional studies regarding KAP of the HCWs toward MERS-CoV. The findings of this study was compared with a cross- sectional study conducted on 280 HCWs in Al-Qassim region hospitals and another one conducted on 1,147 adults recruited from various shopping malls in Riyadh, Saudi Arabia.[12,13] In this study, the majority of participants were aware of the presence of ongoing cases in Saudi Arabia, which is approximated with a study designed to assess the Hajj pilgrims' knowledge about MERS-CoV, where the majority of participants were aware of an ongoing MERS epidemic in Saudi Arabia and of the Saudi MOH recommendations for at-risk pilgrims to postpone performing the Hajj in 2013.[14] In the Riyadh study, many participants revealed low knowledge regarding the period of communicability (43.6%), incubation period (33.6%), and unavailability of vaccine (25.5%).[13] In Al-Qassim study, 30% answered wrong when asked about the availability of the vaccine.[12] Compared with this study, only 37.6% answered that there was no vaccine. Riyadh study showed a higher level of proper hygienic practices among participants. Ninety-four percent of the participants reported washing hands regularly, and more than 90% reported using respiratory etiquette measures with significant increase in hygiene awareness after the interventional program.

In a study aimed to examine the KAP toward the use of facemasks among hospital-based HCWs in Hanoi, Vietnam, where facemasks and respirators were considered as an effective approach of preventing respiratory infections, most participants described facemasks/respirators as the only and the best protective method available to protect HCWs from respiratory infections.[15] In our study regarding to self-care and safety measures during pandemic, the majority agreed postintervention that wearing a face-mask is crucial (7.5% before and 4.3% after preintervention).

On the basis of a 3-month study of 141 registered nurses enrolled in a BSc nursing program at the University of Ibadan, Nigeria, alterations in knowledge and attitudes resulting from intense instructions on HIV/AIDS, patient care, and compliance with universal precautions were investigated. These knowledge enhancement and attitudinal transformation emphasizes the importance of such educational programs as in this study.[16] In an educational program for hepatitis B, a total of 103 (42%) residents responded to the survey. The survey indicated that residents lacked the necessary knowledge and risk assessment skills concerning HBV. A significant increase in the immediate postintervention knowledge scores from a mean of 29% at baseline to 70% ($P < 0.001$) was observed, which sustained 6 months postintervention (65%; $P < 0.001$). No significant differences were observed in documentation skills. However, according to our study, both knowledge and practice significantly improved. In an interventional Indian study on dental student, significant improvements in their information and positive attitude toward H1N1 pandemic influenza outbreak were shown, which indicates the importance of such educational programs.[17] However, the behavioral response of the participants was poor, which may be attributed to the structure of the program.

Logistic regression analysis identified that experience (age) of participants and their educational level were the most predictors of knowledge, as there is a tendency of improving and gaining more knowledge. A study that targeted the knowledge and attitude of physicians toward influenza found that older and more experienced physician revealed higher rates of knowledge and awareness, which correlates with this study. In the Al-Qassim study, gender and experience were the two demographic variables significantly associated with the mean scores of knowledge and attitude.[12] in the Riyadh study, gender was the only significant predictor of concern and knowledge.[13]

A study of KAP of health professionals regarding H1N1 showed that 42.9% of health professionals were not sure that the standard surgical mask would protect them, 22.1% did not believe that washing hands with water and soap is protective, and 27.3% were undecided. These findings showed that there is a significant lack of knowledge among the health professionals even at the level of basic protection and infection control measures. To remedy this lack of knowledge, more education and practical applications are needed.[18] These results correlates with this study that there is a gap of knowledge among HCWs. There is an opportunity for more education and awareness without causing panic among public. Establishing professional and occupational programs among HCWs is crucial to level up their KAP. Periodic educational interventions using locally adjusted methods could contribute to preventing poor practice and lack of knowledge. A stepwise approach should be conducted to raise the "KAP" of HCWs by implementing well-structured interventional programs.

Table 2: Knowledge of the studied participants regarding MERS-CoV 3 months before and after implementation of the health education program

Knowledge of participants[a] regarding MERS	Preintervention (*N* = 398)		Postintervention (*N* = 398)		*Z*-test	*P*
	Yes	%	Yes	%		
Hearing about MERS CoV	398	—	398	—		
Presence of cases in KSA						
Yes	303	76.1	383	96.2	7.93	<0.001
No	43	10.8	10	2.5	4.43	<0.001
I do not know	52	13.1	5	1.3	6.18	<0.001
The cause of the disease						
Virus	340	85.4	391	98.2	12.77	<0.001
Bacteria	42	10.6	4	1	7.02	<0.001
I do not know	16	4	3	0.8	2.71	<0.01
Source of infection						
Infected persons	240	60.3	330	82.9	5.51	<0.001
Consumed pork	108	27.1	55	13.8	1.26	>0.05
I do not know	50	12.6	13	3..3	4.49	<0.001
Mode of transmission						
Sneezing	180	45.2	403	101.3	17.29	<0.001
Touching the mouth	115	28.9	222	55.8	7.74	<0.001
Kissing and shaking hands	170	42.7	252	103.2	5.38	<0.001
Touching contaminated surfaces	182	45.7	411	11.8	17.29	<0.001
Consuming pork meat	51	12.8	47	—	0.3	>0.05
I do not know	—	—	—	—	—	—
At risk group						
Pregnant women	30	7.5	210	52.8	7.01	<0.001
Children less than 5 years old	33	8.3	109	27.4	4.43	<0.001
I do not know	335	84.2	79	19.8	3.42	<0.001
Symptoms of the disease						
High temperature	270	67.8	240	60.3	2.25	<0.05
Cough, sore throat, runny or blocked nose	112	28.1	379	95.2	19.21	<0.001
Diarrhea or vomiting	42	10.5	125	31.4	9.54	<0.001
Body aches, headaches	37	9.2	157	39.4	10.72	<0.001
Difficulty of breathing	137	34.4	403	101.5	17.29	<0.001
I do not know	—	—	—	—	—	—
Complications						
Sever illness that can lead to death	183	46	255	64.1	17.29	<0.001
No serious illnesses	43	10.8	44	11.1	7.74	<0.001
I do not know	172	43.2	99	24.8	5.38	<0.001
Presence of treatment						
Yes	219	55	295	74.1	6.4	<0.001
No	30	7.5	23	5.8	2.4	<0.001
I do not know	149	37.5	80	20.1	6.02	<0.001
What about the vaccination against MERS CoV infection?						
No idea	126	31.7	198	49.7	6.18	<0.001
No need	122	30.7	100	25.1	4.57	<0.001
No vaccine	150	37.6	100	25.2	3.26	<0.001

[a]There was an overlap in some answers of the participants.

Table 3: Attitude of studied participants regarding MERS CoV 3 months before and after implementation of the health education program

Attitude regarding MERS CoV*	Pre-intervention (*N* = 398)		Post-intervention (*N* = 398)		χ^2	*P*
	N	%	*N*	%		
If the disease is dangerous						
Yes	280	70.4	333	83.7	16.91	<0.001
No	118	29.6	65	16.3		
Do you worry about suffering from MERS CoV?						
Yes	131	32.9	223	56	47.78	<0.001
No	268	67.1	175	44		
Has your daily life been disturbed by A/MERS CoV						
Yes	157	39.4	126	31.7	5.61	<0.05
No	241	60.6	272	68.3		
Interest in knowing the methods of prevention						
Yes	135	34	238	59.8	71.01	<0.001
No	263	66	160	40.2		
Is the protective measures are sufficient for prevention?						
Yes	144	36.2	252	63.3	13.05	<0.001
No	254	63.8	146	36.7		
Be afraid of MERS CoV vaccines if present						
Yes	142	35.7	268	67.3	8.41	<0.01
No	256	64.3	130	32.7		
Taking the vaccine if present						
Yes	161	40.5	211	53	53.52	<0.001
No	237	59.5	187	47		
Notification of a suspected case						
Yes	188	47.3	201	50.5	0.69	<0.05
No	210	52.7	197	49.5		
Interesting in following the disease news						
Yes	186	46.7	260	65.3	11.49	<0.001
No	212	53.3	138	34.7		
Available information						
Sufficient	181	45.5	230	57.8	47.78	<0.001
Insufficient	217	54.5	168	42.2		
Measures taken by government						
Sufficient	184	46.2	230	57.8	8.42	<0.01
Insufficient	214	53.8	168	42.2		
Continuity of these measures						
Yes	183	46	212	53.3	12.93	<0.001
No	215	54	186	46.7		

Table 4: Practice of participants regarding MERS CoV 3 months before and after implementation of the health education program

Practice of studied participants regarding MERS CoV[a]	Preintervention (*N* = 398)		Postintervention (*N* = 398)		*Z* test	*P*
	Yes	%	Yes	%		
Practice questions pertaining to hygiene						
a. When coughing and sneezing						
Covered mouth and nose with tissue or handkerchief	243	61	344	86.4	47.02	<0.001
Threw away the used tissue into the bin	189	47.5	265	66.6	16.12	<0.001
Turn face from others	138	34.7	310	77.9	116.33	<0.001
Spit in public area	253	63.6	157	39.4	29.74	<0.001
b. I wash my hands						
Before touching eyes or nose	169	42.5	208	52.3	149.36	<0.001
After toilet	141	35.4	343	86.2	39.41	<0.001
Using soap	216	54.3	348	87.4	105.76	<0.001
Measures for protection						
If contact with an infected person	176	44.2	250	62.8	37.81	<0.001
Avoid contact with infected case	256	64.3	294	73.9	10.4	<0.001
Avoid touching or shaking hands	244	61.3	341	85.7	9.69	<0.05
Put a handkerchief on your nose and mouth	267	67.1	380	95.5	1.35	>0.05
Go to the doctor if you experience any symptoms of the disease	132	33.1	351	88.2	149.36	>0.05
Questions pertaining to self-care and safety measures during pandemic						
a. Face mask usage						
Never use it	350	88	188	48.5	26.18	<0.001
Wear face mask when having fever, cough, or runny nose	14	3.5	50	12.6	16.32	<0.001
Make sure mask fully covered mouth and nose properly	17	4.3	30	7.5	59.67	<0.001
Wear the face mask recommended by Ministry of Health	7	1.8	10	2.5	116.25	<0.001
b. Social distancing during outbreak						
Avoid going to crowded places	134	33.7	187	46.9	26.18	<0.001
Avoid going to shopping mall	63	15.8	157	39.4	16.32	<0.001
Practiced social distancing	110	27.6	188	47.2	59.67	<0.001
It is very important not to leave the house	221	55.5	287	72.3	116.25	<0.001
c. Crowded areas						
Wear facemask at crowded areas	55	13.8	85	21.6	47.02	<0.001
Used "hand sanitizer" at crowded places	7	1.8	12	3.1	16.12	<0.001
d. Self-health care						
Wash hands frequently specially after shaking hands with others	216	54.3	367	92.2	12.5	<0.001
Avoid sharing fork and spoon during eating	112	28.1	201	50.5	18.44	<0.001
Seek for additional information regarding (MERS CoV)	84	21.1	218	54.8	9.15	<0.05

[a]There was an overlap in answers of the participants.

Table 5: Knowledge, attitude, and practice (KAP) scores of studied children before and after implementation of the health education program

KAP scores	Participants (*N* = 398)				χ^2	*P*
	Pretest		Posttest			
	N	%	*N*	%		
Knowledge						
Satisfactory	170	42.7	274	68.8	51.16	<0.001
Unsatisfactory	228	57.3	124	31.2		
Attitude						
Positive	177	44.5	258	64.8	29.65	<0.001
Negative	221	55.5	140	35.2		
Practice						
Good	132	33.2	262	65.8	4.81	<0.05
Poor	266	66.8	136	34.2		

Table 6: Logistic regression analysis of the association between sociodemographic criteria and knowledge scores of studied children

Sociodemographic criteria	Knowledge				χ^2	*P*	Odds ratio	
	Satisfactory (*N* = 170)		Unsatisfactory (*N* = 228)				Value	95% CI
	N	%	*N*	%				
Age								
≤40 years (180)	72	42.4	108	47.4	2.46	>0.05	1.36	0.92–1.48
>40 years (218)	98	57.6	120	52.6				
Previous training								
Trained (112)	84	49.4	28	12.3	0.19	>0.05	0.92	0.62–1.35
Untrained (286)	86	50.6	200	87.3				
Type of job								
Nurses (219)	32	18.2	58	25.4	6.47	<0.05	0.6	0.41–0.89
Technicians (201)	60	35.3	128	56.1				

Conclusion

There is no doubt that MERS-CoV awareness is very important for prevention and increasing attention for seeking early medical care and dealing with MERS-CoV infections. The KAP among HCWs in Makah Al-Mukarramah, KSA, was not optimal; so, their exposure to well-constructed health education programs is critical to fulfill their defect, especially among the least knowledgeable and younger population, as a cornerstone element preventing the virus spread and disease outbreak. This study recommended for establishing more professional interventional programs among HCWs to augment their knowledge, enforce their positive attitude, and taking their practice to the optimal desired level.

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