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Research Article

KNOWLEDGE, ATTITUDE, AND PRACTICE TOWARD MERS-COV AMONG PRIMARY HEALTH CARE WORKERS IN AL KHOBAR AND DAMMAM CITY, KSA 2019.¹Saad Hamad Almakhayitah, ²Marwan Mohammed Alothman, ³Mohammed Ali Alamin¹MBBS, R4 Family Medicine Resident, Ministry of health, Eastern Province, Saudi Arabia.,²MBBS, R4 Family Medicine Resident, Ministry of health, Eastern Province, Saudi Arabia.,³MBBS, MPH, MD, GH-LPM, Research coordinator, SPFMP, EP, MOH, Family Medicine

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Article Received: November 2020 **Accepted:** December 2020 **Published:** January 2021**Abstract:**

Introduction: Middle East respiratory syndrome coronavirus or MERS-CoV was first identified in Saudi Arabia in 2012. Key health care workers are at critical risk to get infected with MERS-CoV or any other infectious diseases. Therefore, it is necessary to evaluate their knowledge, attitude and practice towards these diseases.

Methodology: This is a descriptive-analytic cross-sectional study on 335 health care workers in PHCC in Al-Khobar and Dammam cities in Saudi Arabia. The participant was invited after their consent to fill in a self-administrated questionnaire to assess their knowledge, attitude and practice towards MERS-CoV.

Results: A total of 335 health care workers were included in the study; 57.9% of them were females. Participants demonstrated a relatively high level of knowledge and a positive attitude towards MERS-CoV, with significant associations between profession ($P=0.000$) and being trained in MERS ($P=0.000$) and their knowledge, as trained workforce recorded a high mean score of knowledge (68 ± 18.1). Moreover, profession, years of experience and number of MERS cases seen in last year were significantly associated with their attitudes with ($P=0.00$), ($P=0.005$) and ($P=0.006$), respectively.

Conclusion: Health care workers in AL-Khobar and Dammam city in Saudi Arabia showed good knowledge and positive attitudes and practice of MERS; however, there is still room for development in certain areas. Comprehensive and regular educational campaigns should be carried out among healthcare workers to fill the gap between different professions of health care workers regarding their knowledge, attitude and practice.

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INTRODUCTION:

The Middle East respiratory syndrome (MERS) is a viral respiratory disease caused by A novel coronavirus (middle east respiratory syndrome coronavirus, or MERS-CoV) that was first identified in Saudi Arabia in 2012.” The most common symptoms of MERS-COV are fever, cough, and shortness of breath. It also has gastrointestinal symptoms, diarrhea. Pneumonia is common, but not always present. Some confirmed cases of MERS-COV are asymptomatic. The MERS-COV can be transmitted from human to human by close contact. The main reservoir host is camels [1]. The severe complications may be followed by MERS-COV such as pneumonia, kidney failure and death. People with comorbidities, including diabetes, cancer, chronic lung, heart and kidney diseases, are more likely to be infected with MERS-COV. The incubation period for MERS-COV is usually about 2 to 14 days [2].

A study was done in China, 2015, about MERS-CoV Knowledge among Medical Students. The study revealed that Chinses had good knowledge of MERS-CoV. Knowledge about MERS-CoV was lowest in nursing student and higher in management majors [3].

A cross-sectional study was done in GCC countries, 2017 by gulf indicator smartphone application project. The result of the study found 37% of respondents knew that MERS-COV had an effect on the respiratory system, and 23% of the participants knew the other body parts. Less than 44% of the participants answered the MERS-COV is a severe and serious [4].

A study in Saudi Arabia 2017 discussed the geographical distribution of MERS-CoV cases in EP, which showed 20 % of cases which is lower than western and central regions. (40.8%, 31.9%) respectively [5].

Assiri A, Al-Tawfiq JA. *et al* conducted a descriptive study of Epidemiological, demographic, and clinical characteristics of MERS-CoV cases in Saudi Arabia in 2013. The vast majority, 96% of the patient, had comorbidities such as diabetes, hypertension, chronic kidney disease and chronic cardiac disease [6].

There are two studies done in Riyadh about knowledge of MERS-CoV 2017. The first study showed 58.3% had epidemiological knowledge, while 90.7% had the knowledge about clinical features. The other study revealed that the majority of students heard about the disease before the outbreak

in their hospitals, but only a minority of the student had knowledge of the basic sciences. [7-8].

An interventional study was done by Alkot Mohammad, Albouq Mohammed Asad. *et al* to study the knowledge, attitude and practice toward MERS-COV among primary health care worker in Makkah Almukaramah, 2016. The result of MERS-CoV knowledge of participants in this study have improved after intervention from 42.7% to 68.8%. The study showed 44.5% of the participants had a positive attitude, which increased to 64.8 % after intervention by the training program. There is an association between the age and knowledge, 57.6% of participants more than 40-year-old had satisfactory knowledge, whereas the participant less than 40 years old, only 42.4% had satisfactory knowledge [9].

A Study in Qassim, Saudi Arabia in 2014 assessed the knowledge, attitude, of health care workers about Middle East respiratory syndrome in multispecialty hospitals. The study found that 73.2% of the health care workers had good knowledge, while 26.8% had poor knowledge of MERS-CoV. Regarding the attitude toward MERS-CoV showed positive 82.35% while 17.65% of health care workers had a negative attitude [10].

Another study was done in Makkah hospitals, 2015 about knowledge, attitude and practices of health care providers toward MERS-CoV infection. Only around one third, 32.4% of health care providers had good knowledge, and 67.6% had poor knowledge. Regarding the attitude toward MERS-CoV, only 8.2% had a positive attitude, and 91.8% had a negative attitude. The majority, 87.9% showed good practice and 12.1%, had poor practice [11]. Study about MERS-CoV Coronavirus and Other Emerging Infectious Diseases among Healthcare Workers in the Kingdom of Saudi Arabia done in 2016. The result of the study was poor about knowledge of MERS-CoV disease. About two-thirds of healthcare workers were unaware of following guidelines for the care of patients with MERS-CoV [12].

Alqahtani Ali Saeed, Studied knowledge and attitude toward Middle East respiratory syndrome coronavirus among health colleges’ student in Najran, Saudi Arabia 2017. In general, the knowledge of colleges’ student was satisfactory. Regarding assessing their knowledge of the basic science, 21.1% knew the first case of human infection with MERS-CoV in Saudi Arabia, and 30% of student knew the incubation period of the disease. About 54% knew the genus to which the virus belonged. Regarding assessing of diagnosis and treatment, 34.7% of the

colleges' student answered correctly about the lab test that can be used to diagnose MERS-CoV. The majority, 84% of the student, knew the typical symptoms of MERS-CoV. 51.4% of the student about antibiotics that has no role in the treatment of MERS-CoV. Regarding assessing of transmission and prevention, about 85% were aware. Regarding attitude, the majority of students had positive attitude [13].

Justification:

MERS-CoV is a global health problem that is firstly detected in Saudi Arabia. The MERS-CoV is a serious disease that will lead to a fatal complication. At the end of September 2018, a total of 2260 laboratory-confirmed cases MERS-CoV, including 803 associated deaths (case –fatality –rate: 35.5%) were reported globally. The majority of these cases were reported from Saudi Arabia (1882 cases, including 729 related deaths with a case fatality rate of 38.7%) [1]. The primary health care worker is a major risk group for infection because they are the first level of contact with the patient. In this study, by identifying the gap in knowledge and practice of MERS-CoV among PHC workers will contribute to better services to MERS-CoV cases and better control of infection transmission among and by the health workers. There is no local study in Eastern province about knowledge, attitude, and practice toward MERS-CoV among primary health care worker.

Research question:

What are the level of knowledge, the direction of attitude, and current practice toward MERS-CoV among primary health care workers in Al-Khobar city, KSA, 2019?

Research Aim:

To assess the PHC workers knowledge, attitude, and practice toward MERS-CoV in Al Khobar and Dammam city, EP.

Research Objectives:

- To evaluate the level of knowledge about MERS-CoV among MOH key Primary health care workers in Al Khobar and Dammam city, EP.
- To identify attitude toward MERS-CoV among MOH key Primary health care workers in Al Khobar and Dammam city, EP.
- To assess the current practice of MOH key Primary health care workers regarding MERS-CoV Preventive measures in Al Khobar and Dammam city, EP.

- To identify associated factors with MOH key Primary health care workers knowledge, attitude, and practice toward MERS-CoV In AL Khobar and Dammam city, EP.

MATERIAL AND METHOD:

Study population, sitting and time:

This study was conducted among Key PHC workers which included physicians, nurses and technicians working in MOH PHC centres in Al Khobar and Dammam city, EP (N= 1055), EP, SA 2018.

Inclusion criteria:

Key PHC workers was including physicians (GPs, FM residents, FM specialists, and FM consultants), nurses and technicians working in MOH primary health care centres in AL Khobar and Dammam city, EP (N =335).

Exclusion criteria:

All PHC workers were not in contact with patients (working in administration), Pharmacists and Dentists.

Study design:

Descriptive analytic cross-sectional study.

Study variables:

Dependent variables:

- Knowledge of MERS-COV among MOH key Primary health care workers in Al Khobar and Dammam city, EP, Saudi Arabia.
- Attitude toward MERS-COV among MOH key Primary health care workers in Al Khobar and Dammam city, EP, Saudi Arabia.
- Practice of MERS-COV among MOH key Primary health care workers in Al Khobar and Dammam city, EP, Saudi Arabia.

Independent variables:

Socio-demographic characteristics such as age, gender, educational level, economic status.

Study sampling:

Sample type and technique:

Non-sampled study (total coverage) all health worker meeting inclusion criteria in all of AL Khobar and Dammam city PHC centres were included.

Data collection instrument and methods:

A self-administered questionnaire was used to collect the data. The questionnaire had been adopting from previously published studies with some modifications [9,13], and from MOH (MERS-CoV) guideline [14]. The questionnaire includes four sections:

- The level of knowledge about MERS-CoV among PHC physician in Al Khobar and Dammam city, EP
- Practice of MERS-CoV among Primary care physician in Al Khobar and Dammam city, EP
- Attitude of MERS-CoV among Primary care physician in Al Khobar and Dammam city, EP

Pilot study:

It was done on 50 participant sample similar to the sample that was studied to clarify the validity of the questionnaire.

Modification was done according to the pilot results.

Ethical consideration:

Institutional review board approval gained from MOH, Eastern province IRB.

Informed consent was taken before the respondents.

Data management and analysis plan:

Data entered into a personal computer, and it was analyzed by using (SPSS) software version 26. All variables were coded before.

RESULTS:

Table (1): Description of Socio-demographic characteristics of the participants from the key health workers in Dammam and Alkhobar cities (N=335)

Parameter	Frequency	Percent
Gender		
• Male	141	42.1%
• Female	194	57.9%
Age		
• From 25 - 34 Years old	234	69.9%
• From 35 - 44 Years old	94	28.1%
• From 45 - 55 Years old	7	2.1%
Mean±SD	32.70±4.84	
Marital status		
• Single.	52	15.5%
• Married.	263	78.5%
• Divorced.	19	5.7%
• Widowed.	1	.3%
Profession		
• FM Consultant/specialist	23	6.9%
• FM Resident	91	27.2%
• General physician	70	20.9%
• Nurse	116	34.6%
• Technical staff (lab, X-ray)	35	10.4%
Years of experience since graduation from college?		
• 1-9 years	254	75.8%
• 10-18 years	72	21.5%
• 19-28 years	9	2.7%
Mean±SD	7.01±4.77	
Have you heard about MERS- CoV?		
• Yes	292	87.2%
• No	43	12.8%
Have you attended a training course of MERS-CoV in last year?		
• Yes	37	11.0%
• No	298	89.0%
How many MERS-CoV cases seen during the previous year?		
• 0	285	85.1%
• 1-5	41	12.2%
• 6-10	5	1.5%
• More than 10	4	1.2%
Do you have a protocol of MERS-CoV management in your office?		
• Yes	46	13.7%
• No	188	56.1%
• I don't know.	101	30.1%

Table (1) shows the description of Socio-demographic characteristics of the participants from

the key health workers in Dammam and Al-Khobar cities. A total of 335 participants were included in the

study. The mean age was 32.70 ± 4.84 years (mean \pm standard deviation [SD]), ranged from 25 and 55 years. Females and males were (57.9%) and (42.1%), respectively, among of them (78.5%) were married, (15.5%) single, (5.7%) divorced and (0.3%) widowed. Regarding the profession (34.6%) were nurse, whereas FM Resident, General physician, Technical stuff and FM Consultant/specialist (27.2%), (20.9%), (10.4%) and (6.9%) respectively. The majority (89.0 %) of the participants had attended a training course about MERS-CoV in last year, (11.0%) were not. Those who had not seen

MERS-CoV cases during the previous year made up (85.1%) of the total, (12.2%) seen less than 5 cases while those who seen between 6 to 10 cases and more than 10 cases were (1.5%) and (1.2%) respectively. About half of health care worker haven't had a protocol of MERS-CoV management in work (56.1%), (13.7%) have a protocol and (30.1%), don't know. Majority of health care worker has heard about MERS- CoV (87.2%), were as (12.8%) were not. The mean years of experience since graduation from college was 7.01 ± 4.8 years.

Table (2): Key PHC workers responses to MERS-CoV Knowledge questions (N=335)

Parameter	Correct	Incorrect
Where are the most cases of MERS-CoV presented in Saudi Arabia?	24.2%	75.8%
Where did the first case of MERS-CoV happen in the world?	60.3%	39.7%
What is the cause of MERS-CoV infection?	82.4%	17.6%
What is the direct mode of transmission?	78.8%	21.2%
What is the indirect mode of transmission?	53.7%	46.3%
What are three typical symptoms of MERS-CoV?	73.7%	26.3%
Is there a gastrointestinal symptom in MERS-CoV?	36.1%	63.9%
Is there an available vaccination for MERS-CoV?	69.0%	31.0%
What is the score of visual triage checklist that indicates admission of respiratory illness patients to isolation room?	18.2%	81.8%
Is there a treatment or cure for MERS-CoV?	60.9%	39.1%
If you have suspected case of MERS-CoV, what the appropriate management?	71.3%	28.7%
Is the MERS-CoV can lead to death?	66.3%	33.7%
What is the fatality rate for MERS-CoV cases in Saudi Arabia?	8.4%	91.6%

Table (2) shows the response of key PHC workers to MERS-CoV knowledge questions. Poor knowledge was more apparent in response to questions regarding where are the most cases of MERS-CoV presented in Saudi Arabia (24.2%), the presence or absence of gastrointestinal symptoms in MERS-CoV (36.1%), the score of visual triage checklist that requires respiratory illness patients to be admitted to isolation room (18.2%) and the fatality rate for MERS-CoV cases in Saudi Arabia (8.4%). Whereas, relatively high level of knowledge was assessed regarding the

answers to following questions; the cause of MERS-CoV infection (82.4%), the direct mode of transmission (78.8%), mentioning three typical symptoms in MERS-CoV (73.7%), the appropriate management in case of suspecting a case of MERS-CoV (71.3%), the availability of MERS-CoV vaccination (69%) if MERS-CoV infection can result in the patient's death (66.3%), the presence of treatment for MERS-CoV (60.9%), where did the first case of MERS-CoV take place (60.3%) and knowing the indirect mood of transmission (53.7%).

Table (3): Attitude of the key health workers in Dammam and Alkhobar cities towards MERS-CoV (N=335)

Parameter	Agree	Neutral	Disagree
MERS-CoV is a dangerous disease.	91.6%	7.8%	0.6%
I am interested in knowing the preventive measures for MERS-CoV.	95.5%	4.2%	0.3%
The availability of protective measurement is sufficient for prevention.	51.0%	22.1%	26.9%
I think I am at risk of getting a MERS-CoV infection.	71.3%	23.3%	5.4%
I am worried about suffering from MERS-CoV.	64.2%	26.9%	9.0%

Hookah is something to be wary of in transmitting the infection.	77.0%	19.1%	3.9%
It is possible to get infected by getting in contact with camels or consuming camel's products.	83.3%	13.7%	3.0%
It is necessary to start screening everybody who has symptoms of a cold or flu for MERS-CoV.	69.9%	11.0%	19.1%
MERS-CoV PPE availability is adequate in your centre.	47.5%	23.6%	29.0%

Table (3) assesses the attitude of key health workers towards MERS-CoV and found that the most positive attitudes of healthcare providers observed regarding the MERS-CoV are a dangerous disease (91.6%), (95.5%) were interested in knowing the methods of prevention, there is a risk of infection by getting in contact with camels or consuming camel's products (83.3%), Hookah can be a method of transmitting the infection (77%), (71.3%) of the key health workers

thought that they are at risk of getting MERS-CoV infection, (69.9%) of them believed that it is essential to screen each and every individual who has symptoms of a cold or flu for MERS-CoV, and (64.2%) were worried about suffering from MERS-CoV. Slightly poor behaviour was noticed regarding the availability of protective measurements for prevention (51%) and the adequacy of MERS-CoV PPE in the PHCC (47.5%).

Table (4): Self-reported practice related to MERS-CoV prevention among Key PHC workers in Dammam and Khobar (N=335)

Parameter	Good practice	Poor practice
On coughing and sneezing, I cover mouth and nose with tissue or handkerchief.	89.9%	10.1%
I wash my hands before touching the patient.	89.3%	10.7%
I wash my hands after touching the patient.	95.2%	4.8%
I wash my hands after being exposed to body fluids.	97.6%	2.4%
I wash my hands before any clean or aseptic procedure.	96.4%	3.6%
I wash my hands after touching the patients' surroundings.	86.9%	13.1%
In case of using this personal protective equipment (PPE), I follow this order gowns, surgical mask, eye protection and gloves.	93.1%	6.9%
In case of removing these personal protective equipment (PPE), I follow this order surgical mask, eye protection, gloves and gowns.	92.5%	7.5%
I refer the patient when he has fever $\geq 38^{\circ}\text{C}$, body aches, headache, diarrhea, or nausea/vomiting with or without respiratory symptoms, leukopenia (WBC $< 3.5 \times 10^9/\text{L}$) and thrombocytopenia (platelets $< 150 \times 10^9/\text{L}$)	93.1%	6.9%

Table (4) assesses the self-reported practice related to MERS-CoV among key PHC workers. It recorded good practice among the majority of health workers regarding all of the mentioned measures which included; washing hands after being exposed to body fluids (97.6%), washing hand before any clean or aseptic procedure (96.4%), following this order gowns, surgical mask, eye protection and gloves in case of using PPE (93.1%), following this order gowns, surgical mask, eye protection and gloves in case of removing PPE (92.5%), referring the patient

when he has fever $\geq 38^{\circ}\text{C}$, body aches, headache, diarrhea, or nausea/vomiting with or without respiratory symptoms, leukopenia (WBC $< 3.5 \times 10^9/\text{L}$) and thrombocytopenia (platelets $< 150 \times 10^9/\text{L}$) with (93.1%), covering mouth and nose with tissue or handkerchief on coughing and sneezing (89.9%), washing hands after touching the patient's surroundings (86.9%) and washing hands before and after touching the patient with (89.3%) and (95.2%), respectively.

Table (5): MERS-CoV knowledge, attitude and practice score in association with socio-demographic and work experience (N=335)

Parameter		Knowledge score	P-value	Attitude score	P-value	Practice score	P-value
		Mean Rank		Mean Rank		Mean Rank	
Sex	Male.	175.15	0.246*	158.12	0.106*	167.98	0.996*
	Female.	162.80		175.18		168.02	
Age	From 25 - 34 Years old	167.97	0.881**	162.67	0.009**	163.04	0.195**
	From 35 - 44 Years old	166.74		187.22		179.09	
	From 45 - 55 Years old	185.71		88.14		184.93	
Marital status	Single.	176.05	0.847**	138.23	0.093**	160.20	0.266**
	Married.	166.57		172.81		171.39	
	Divorced.	168.87		184.55		139.92	
	Widowed.	108.00		136.50		215.50	
Profession	FM Consultant/specialist	235.41	0.000**	111.48	0.000**	142.83	0.000*
	FM Resident	190.14		167.84		129.07	
	General physician	221.66		135.14		194.71	
	Nurse	127.59		188.38		188.74	
	Technical staff (lab, X-ray)	92.76		203.74		163.61	
Years of experience since graduation from college?	1-9 years	44.23	0.992**	38.20	0.626**	31.53	0.010*
	10-18 years	43.26		45.91		38.52	
	19-28 years	43.39		44.00		49.63	
Have you attended a training course on MERS-CoV in last year?	Yes	232.12	0.000*	172.28	0.772*	180.07	0.311*
	No	160.04		167.47		166.50	
How many MERS-CoV cases seen during the previous year?	0	165.72	0.209**	173.01	0.078**	170.22	0.523**
	1-5	186.29		147.32		158.38	
	6-10	109.20		100.20		154.30	
	More than 10	216.75		107.88		125.75	

* Mann-Whitney U test was used.

** Kruskal Wallis Test was used.

For analysing MERS-CoV knowledge, attitude and practice association with socio-demographic and work experience, first the normal distribution of knowledge, attitude and practice scores was checked. Shapiro-Wilk test was used as a test of normality and found that all of the scores are not normally distributed (sig. values = 0.000 for knowledge, attitude and practice). So we reject the null hypothesis that scores are normally distributed. Based on the normality test result we used Mann-Whitney U test and Kruskal Wallis Test.

Table (5) demonstrates the association between MERS-CoV knowledge, attitude and practice score and socio-demographic data and work experience of the key health workers in PHCCs. Regarding the

knowledge score, there is a significant association between the profession of health workers and their level of knowledge (P=0.000), as the highest level of knowledge was assessed among the FM consultants/specialists with a mean score of (235.41), general physicians (221.66), and family medicine residents with (190.14), while the nurses and the technical staff recorded a lower level of knowledge with (127.59) and (92.76), respectively. Another significant association was found between the level of knowledge about MERS-CoV infection and the health workers' attendance of training course of MERS-CoV in last year (P=0.000), as the health workers who attended the training recorded a high level of knowledge with (232.12). Concerning the attitude of our population, age was found to be

significantly associated with their attitude ($P=0.009$), as the participants aged from (35-44 years) reported the most positive attitudes with mean score of (187.22), while the older participants aged (45-55 years) reported more negative attitudes (88.14). There is also has been a significant association between their profession and the attitude ($P=0.000$), as the attitude was satisfying among nurses and the technical staff attitude with mean score (188.38) and (203.74), respectively, while the relatively unsatisfying results were recorded among FM consultants/ specialists (111.48), general physicians (135.14) and FM residents with (167.84). In regards to the practice score, a significant association between the profession and practice level was observed ($P=0.000$). General physicians, nurses and technical staff recorded the highest level of practice with a mean score of (194.71), (188.74) and (163.61), respectively, while the family medicine residents with (129.07) and family medicine consultants/ specialists with (142.83) recorded quite lower score.

DISCUSSION:

Controlling the emerging infectious diseases in hospitals can be restricted by management and detection of cases by transmission-based precautions to the confirmed and suspected cases. As for MERS-CoV in the settings of health care facilities, this needs early recognition, airborne precautions and testing [15]. This study analyses data from key health workers in PHCs at Al-Khobar and Dammam city in Saudi Arabia and informs their awareness, attitude and practice about MERS-CoV infection.

Our study included 335 FM consultants/ specialists, FM residents, general physicians, nurses and technical staff, of whom only 11% attended MERS-CoV training last year, and 13.7% of them knew the protocol of MERS-CoV management in their office, which in turn implies poor attention and awareness to MERS-CoV infections among key health workers. A study included 1216 health care workers in Mecca, Medina and Jeddah, and it also reported that only 22.8% of them were trained to deal with infectious diseases, 37.1% were trained in infection control measures, 54.4% were trained in hand hygiene and 45.6% were trained in N95 mask-wearing techniques [12]. Another study in Makkah found that among 398 health workers in PHCC, 28.1% of them were previously trained to be aware of MERS-CoV infection [9].

Our results regarding the knowledge assessment survey that the most number of correct responses were assembled from the questions about the cause of MERS-CoV infection (82.4%), the direct mood of

transmission of the virus (78.8%), the availability of MERS-CoV vaccine (69%) and 66.3% of the participants know that MERS-CoV can lead to death. Whereas, we assessed poor knowledge considering knowing the fatality rate of this viral infection in Saudi Arabia (8.4%) and the score of visual triage that requires referral of the patient to the isolation room (18.2%). The discrepancy in the knowledge survey results maybe because of the fact that most of the educational campaigns by the Saudi authorities have greatly focused on the signs and symptoms of MERS-CoV which has reinforced their knowledge in this aspect of MERS infection [16].

Khan *et al.* [10], conducted a cross-sectional study in Al-Qassim, KSA to evaluate the knowledge and attitude of 153 health care workers towards MERS-CoV and the assessment of the knowledge of their sample was consistent with our results as (77.1%) of their population knew that alpha coronavirus is the cause of MERS-CoV infection, the availability of vaccination for MERS-CoV (71.2%), and 67.3% of them know that MERS-CoV can be fatal.

In this study, the attitudes of the participants were motivating as 95.5% of them were interested to know the methods of prevention of MERS-CoV, 91.6% of them knew that MERS-CoV is a serious and dangerous infection. About 83.3% of the health workers know the possible ways of infections, 77% consider Hookah as something to worry of in transmitting the infection, and 69.9% believe that it is important to screen everybody who has symptoms of a cold or flu for MERS. While over half of them (51%) think that the availability of protective measurements is adequate for prevention and 47.5% of the respondents find PPE availability is sufficient in the PPHC. A cross-sectional descriptive study has assessed the attitude towards MERS-CoV among 820 health care workers and reported that (78.9%) of the respondents believe that the prevalence of MERS can be decreased if the health care workers actively participated in infection control program and 69.5% of them believe that MERS transmission can be prevented using standard and isolation precautions given by Centers for Disease Control and Prevention (CDC), Association for Professionals in Infection Control and Epidemiology (APIC) and World Health Organization (WHO) *etc.* [18].

Furthermore, the self-reported practice results were very encouraging, as it is well-known that the scarcity of hygiene maintenance can result in increased morbidity and mortality of the deadliest virus as MERS [17]. In our results, 89.3% and 95.2% of our participants wash their hands before and after

touching the patients, respectively. Approximately, 97.6% of them was their hand after exposure to body fluids, 96.4% wash their hands before any clean or aseptic procedure and 89.9% cover mouth and nose by tissue or handkerchief on coughing or sneezing. They were also familiar with the correct order of using and removing the PPE with a percentage of (93.1%) and (92.5%). These results are in line with another study that indicated a positive response from the health care workers regarding wearing goggles and gloves while dealing with infectious diseases [19].

The findings of this study demonstrate a significant association between the profession of the health workers ($P=0.000$) and attending trainings in MERS-CoV infection ($P=0.000$) and their level of knowledge, as the highest level of knowledge was assessed among the FM consultants/specialists with a mean score of (235.41), general physicians (221.66), while the nurses recorded a lower level of knowledge with (127.59). Khan et al. [10], had opposing results to ours as nurses (80.79) and pharmacists (80.67) recorded a mean rank of knowledge higher than physicians (68.56), and the association between the profession and level of knowledge was not significant ($P=0.533$). It is therefore indispensable to uncover the aspects regarding MERS knowledge so that all professions of health care workers can play their vital part in educating people to face the threat of MERS to global public health.

Age and the profession were found to be significantly associated with the attitude of health care workers with ($P=0.009$) and ($P=0.000$), respectively. The healthcare workers aged from (35-44 years) reported the most positive attitudes with mean score of (187.22). The attitudes were more satisfying among nurses and the technical staff attitude with mean score (188.38) and (203.74), respectively, while the relatively less satisfying results were recorded among FM consultants/ specialists (111.48), general physicians (135.14) and FM residents with (167.84). In contrast to our results, experience was also found significant regarding the attitudes of health workers with ($P=0.002$) [10]. These results are also in accordance with other studies that have reported positive attitudes of physicians among health care workers [20, 21].

In this study, there has been a significant association between profession ($P=0.000$) and the practice of health care workers. Demonstrating professional and occupational programs among health care workers is necessary to enhance their knowledge, attitude and practice. Periodic educational campaigns with locally

adjusted methods can take part in preventing poor practice and lack of knowledge.

CONCLUSION:

Health care workers in Al-Khobar and Dammam city in Saudi Arabia showed good knowledge and positive attitudes and practice of MERS; however, there is still room for development in certain areas including supporting the workforce by regular trainings in MERS-CoV infection management, the proper preventive measures and the cases that require admission to the isolation room. Comprehensive and regular educational campaigns should be carried out among healthcare workers to fill the gap between different professions of health care workers regarding their knowledge, attitude and practice.

REFERENCES:

1. World Health Organization; 2017 Middle East respiratory syndrome coronavirus (MERS-CoV).
2. Cdc.gov. (2018). MERS-CoV | Symptoms and Complications of MERS | Coronavirus | CDC. [online] Available at: <https://www.cdc.gov/coronavirus/mers/about/symptoms.html> [Accessed 7 Nov. 2018].
3. Liu M, Jiang C, Donovan C, Wen Y, Sun W. Middle East Respiratory Syndrome and Medical Students: Letter from China. *Int J Environ Res Public Health*. 2015;12(10):13289-94.
4. Alqahtani A, Rashid H, Basyouni M, Alhawassi T, BinDhim N. Public response to MERS-CoV in the Middle East: iPhone survey in six countries. *Journal of Infection and Public Health*. 2017;10(5):534-540.
5. Eifan, S., Nour, I., Hanif, A., Zamzam, A. and AlJohani, S. A pandemic risk assessment of middle east respiratory syndrome coronavirus (MERS-CoV) in Saudi Arabia. *Saudi Journal of Biological Sciences*; (2017) 24(7), pp.1631-1638.
6. Assiri, A., Al-Tawfiq, J., Al-Rabeeh, A., Al-Rabiah, F., Al-Hajjar, S., Al-Barrak, A., Flemban, H., Al-Nassir, W., Balkhy, H., Al-Hakeem, R., Makhdoom, H., Zumla, A. and Memish, Z. Epidemiological, demographic, and clinical characteristics of 47 cases of Middle East respiratory syndrome coronavirus disease from Saudi Arabia: a descriptive study. *The Lancet Infectious Diseases*; (2013). 13(9), pp.752-761.
7. Bawazir, A., Al-Mazroo, E., Jradi, H., Ahmed, A. and Badri, M. MERS-CoV infection: Mind the public knowledge gap. *Journal of Infection and Public Health*; (2018). 11(1), pp.89-93.
8. Al-Mohrej, A. and Agha, S. Are Saudi medical students aware of middle east respiratory

- syndrome coronavirus during an outbreak? *Journal of Infection and Public Health*; (2017). 10(4), pp.388-395.
9. Alkot, M., Albouq, M., Shakuri, M. and Subahi, M. Knowledge, attitude, and practice toward MERS-CoV among primary healthcare workers in Makkah Al-Mukarramah: an intervention study. *International Journal of Medical Science and Public Health*. (2016); 5(5), p.952.
 10. Khan, M., Shah, S., Ahmad, A. and Fatokun, O. Knowledge and attitude of healthcare workers about middle east respiratory syndrome in multispecialty hospitals of Qassim, Saudi Arabia. *BMC Public Health*. (2014); 14(1).
 11. Nour Mohamed O, Babilghith Ahmed O, Natto Hatim A, Al-Amin Fowzi O. and Alawneh Sallahaldeen M. Knowledge, attitude and practices of healthcare providers towards MERS-CoV infection at Makkah hospitals, KSA. *International Research Journal of Medicine and Medical Sciences* (2015); 3(4)
 12. Alsahafi, A. and Cheng, A. Knowledge, Attitudes and Behaviours of Healthcare Workers in the Kingdom of Saudi Arabia to MERS Coronavirus and Other Emerging Infectious Diseases. *International Journal of Environmental Research and Public Health*; (2016). 13(12), p.1214.
 13. Alqahtani, A. Knowledge and attitude toward Middle East respiratory syndrome coronavirus among health colleges' students in Najran, Saudi Arabia. *International Journal Of Community Medicine And Public Health* (2017) ;4(8), p.2641.
 14. Moh.gov.sa. (2018). [online] Available at: <https://www.moh.gov.sa/Ministry/MediaCenter/Publications/Documents/Guidelines%20MERS-CoV> [Accessed on 26 October 2020].
 15. Bialek, Stephanie R., et al. "First confirmed cases of Middle East respiratory syndrome coronavirus (MERS-CoV) infection in the United States, updated information on the epidemiology of MERS-CoV infection, and guidance for the public, clinicians, and public health authorities—May 2014." *MMWR. Morbidity and mortality weekly report* 63.19 (2014): 431.
 16. Command and Control Centre, Ministry of Health, Saudi Arabia. Available at: [<http://www.moh.gov.sa/en/CCC/PublishingImages/InfoGraph%20Images/English/Corona%20Infographic%20-%20Work%20Place%20-%20English.jpg>]. [Accessed on 28 October 2020].
 17. Brug, J., Aro, A. R., Oenema, A., De Zwart, O., Richardus, J. H., & Bishop, G. D. (2004). SARS risk perception, knowledge, precautions, and information sources, the Netherlands. *Emerging infectious diseases*, 10(8), 1486.
 18. Asaad, A. M., El-Sokkary, R. H., Alzamanan, M. A., & El-Shafei, M. (2020). Knowledge and attitudes towards Middle East respiratory syndrome-coronavirus (MERS-CoV) among health care workers in south-western Saudi Arabia. *East Mediterr Health J*, 25, 0.
 19. Thu, T. A., Anh, N. Q., Chau, N. Q., & Hung, N. V. (2012). Knowledge, attitude and practices regarding standard and isolation precautions among Vietnamese health care workers: a multicenter cross-sectional survey. *Intern Med*, 2(4), 115.
 20. Rahnavardi, M., Rajaeinejad, M., Pourmalek, F., Mardani, M., Holakouie-Naieni, K., & Dowlatsahi, S. (2008). Knowledge and attitude toward Crimean–Congo haemorrhagic fever in occupationally at-risk Iranian healthcare workers. *Journal of Hospital Infection*, 69(1), 77-85.
 21. Joukar, F., Mansour-Ghanaei, F., Soati, F., & Meskinkhoda, P. (2012). Knowledge levels and attitudes of health care professionals toward patients with hepatitis C infection. *World Journal of Gastroenterology: WJG*, 18(18), 2238.