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Middle East Respiratory Syndrome (MERS): Comparing the knowledge, attitude and practices of different health care workers

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ABSTRACT

Background: Middle East Respiratory Syndrome (MERS) is a viral respiratory illness that was recently recognized in humans. Recently, the Ministry of Health in Saudi Arabia reported a substantial increase in MERS cases, primarily from the Riyadh region. The objective of the present study was to evaluate knowledge, attitude and practices towards MERS among physicians, nurses, pharmacist and technicians individually.

Methods: A cross sectional study conducted at King Khalid University Hospital, Riyadh, Saudi Arabia among individual healthcare workers. The survey questionnaire was self-administrated and consisted of five sections: Demographic; Source of MERS information; Knowledge; Attitude; and Practice of healthcare workers towards MERS.

Results: A total of 391 participants of which physicians (162; 41.4%), pharmacists (18; 4.6%), nurses (130; 33.3%) and technicians (81; 20.7%) were included with a response rate of 95.71%. The majority of the participants were female (53.70%) and mostly in the nurse's category (40.5%). The participants reported the highest main source of information was seminars and workshops (n = 191; 48%) followed by social media (n = 179; 45%). The overall score indicates good knowledge among physicians (95.7%), pharmacists (88.9%), nurses (86.2%) and technicians (91.4%) and showed statistically significant (p = 0.039). The study showed a positive attitude among physicians (96.3%), pharmacist (94.4%), nurses (94.6%) and technicians (90.1%) with no statistically significant (p = 0.273). However, the majority of the participants showed average practices towards MERS. However, the least practice among participants was the use of facemask in the crowds (24.2%). The demographic characteristic's age, gender and professions showed significantly associated with mean knowledge score. Similarly, statistical significance observed in gender and experience demographic variables with a mean attitude score.

Conclusions: The study concludes that different health workers showed good knowledge and positive attitudes, but low to average practices towards MERS with low adherence to facemask practice. When comparing workers, physicians have a high degree of knowledge and attitude when compared to nurses, pharmacist and technicians.

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Introduction

Middle East Respiratory Syndrome (MERS) is a viral respiratory illness that was recently recognized in humans. Globally, 2266 cases of MERS was reported and 804 death [1]. The origin of MERS

virus is not fully understood, but according to the analysis of different virus genomes, it is believed that it has originated in bats and was transmitted to camels [2]. Most people infected with MERS have developed severe pneumonia, extra pulmonary organ dysfunction and ultimately death has ensued [3]. It was first reported in Saudi Arabia in 2012 and since then has spread in over approximately 27 countries. Out of the listed countries, the majority of cases (85%) have been reported from a single country Saudi Arabia [4]. To the date of the study, 1479 cases of MERS patient have been detected in Saudi Arabia, of which 854 (57.8%) have recovered, 617

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(41.7%) have died and 8 (0.5%) are alive and undergoing treatment [5].

Primary cases of MERS were defined as patients who were diagnosed positively with the virus and secondary cases were patients who were tested as a contact of the known case, whether in a household, as an inpatient hospital or as a healthcare worker caring for a case [6–8]. More than half of all laboratory-confirmed cases have been associated with secondary cases, especially in healthcare settings [8] or transmission to close household contacts [6]. The transmission of the MERS virus to health care workers have been reported in different studies [9,10]. The majority of secondary cases reported in Saudi Arabia, were acquired through human-to-human transmission in healthcare settings [6]. Human-to-human transmission seems to be more probable in some cases of health care facilities, especially when infection prevention and control practices are insufficient. A study reported that infection control measures could keep the MERS virus at further restraining by taking appropriate actions otherwise disinclined to work lead to adverse effects on society and even numerous deaths [10]. Similarly, in another study, spread of MERS was reported due to lack of awareness, insufficient infection prevention and control in hospitals and overcrowding in emergency rooms [11].

Currently, there is no specific antiviral treatment recommended for MERS-CoV infection [9,10]. Individuals with MERS often receive medical care to help relieve symptoms [9,10]. As a result, efforts must focus on the prevention of the disease as well as limiting the complications of existing cases. Therefore, health care workers' knowledge, attitude and practice play a major role in the prevention and restrain in complications of MERS infection. The Ministry of Health, Saudi Arabia has designed specific guidelines for educating different healthcare workers based on recommendations of WHO [12].

To date, only two studies have been conducted in Saudi Arabia, one in Makkah and other in Qassim to assess the knowledge and attitude of healthcare workers towards MERS [13,14]. An extensive review of the literature did not yield any result of similar studies in the Riyadh region. Recently, the Ministry of Health in Saudi Arabia has reported a substantial increase in MERS cases, primarily from the Riyadh region [15]. Therefore, the present study objective is to evaluate the knowledge, attitude, practices, and comparing among different health care workers in the Riyadh region.

Methods

This study is a cross sectional, conducted among different healthcare workers at King Khalid University Hospital (KKUH), Riyadh, Saudi Arabia. The study took place from December 2015 to March 2016 and received ethical clearance from the ethical

committee, College of Medicine, King Saud University (KSU). All healthcare workers signed informed consent and assured them of full confidentiality. Different healthcare workers included in this study were physicians, nurses, pharmacists and technicians, inclusion criteria included; that they must have worked at least 6 months in KKUH.

The questionnaire was designed and modified from previously published research articles [13,14]. A group consisting of three professors in the College of Medicine in KSU evaluated the questionnaire. It consists of mainly five sections: (1) Demographic characteristics; (2) Source of MERS information; (3) Knowledge of healthcare workers; (4) Attitude of healthcare workers, and; (5) Practice of healthcare workers towards MERS. To measure the knowledge and practice of healthcare workers towards MERS, in which the options Yes or No against each set of questions were evaluated. To verify the attitude of healthcare workers, three options agree, disagree and neutral variables were used. To measure knowledge of workers, scores ranged from 0 to 13 and cut off level of ≥ 9 considered as good knowledge and < 9 scores was set for poor knowledge. To evaluate the practice of workers towards MERS, a score of ≥ 6 was considered as a good practice while a score of < 6 as a poor practice. A sample of 420 self-administered questionnaire were distributed randomly among healthcare workers. Out of the total 402 were returned and 11 questionnaires were excluded because of incomplete information. The study had 95.71% response rate.

A Statistical Package for Social Sciences Version 21 (SPSS Inc., Chicago, IL, USA) was adopted for data analysis. Descriptive data analysis was used to measure frequencies and proportions. Chi-square and Fisher's exact test was performed to estimate the significance among study variables. The Pearson correlation coefficient was used to assess if there was a relationship between the total score of knowledge, attitude and practice. Differences were considered statistically significant at $p < 0.05$.

Results

A total of 391 participants of which physicians (162; 41.4%), Pharmacists (18; 4.6%), Nurses (130; 33.3%) and technicians (81; 20.7%) were included. Table 1 shows the demographic characteristics of the participants. The study showed that the participants were female (53.70%) and mostly in the nurse's category (40.5%). In terms of age, 50% of physicians were less than or equal to 29 of age compared to pharmacists (4.5%), nurses (25%) and technicians (20.5%). More than half of the physicians (62.3%) had less than one-year experience compared to all other healthcare workers. A total of physicians (67; 36.4%), pharmacist (10; 5.4%), nurses (70;

Table 1
Characteristics of healthcare workers N = 391.

Characteristics	Physicians		Pharmacists		Nurses		Technicians	
	N	%	N	%	N	%	N	%
Age								
≤29	88	50.0	8	4.5	44	25.0	36	20.5
30–39	38	33.1	5	4.3	52	45.2	20	17.4
40–49	20	33.3	2	3.3	25	41.7	13	21.7
≥50	16	40.0	3	7.5	9	22.5	12	30.0
Gender								
Male	82	45.3	15	8.3	45	24.9	39	21.5
Female	80	38.1	3	1.4	85	40.5	42	20.0
Experience								
≤1 year	48	62.3	3	3.9	5	6.5	21	27.3
1–3 years	24	39.3	2	3.3	25	41.0	10	16.4
3–5 years	23	33.3	3	4.4	30	43.5	13	18.8
≥5 years	67	36.4	10	5.4	70	38.0	37	20.2
Total	162	41.4	18	4.6	130	33.3	81	20.7

Main source of MERS information reported by Healthcare workers

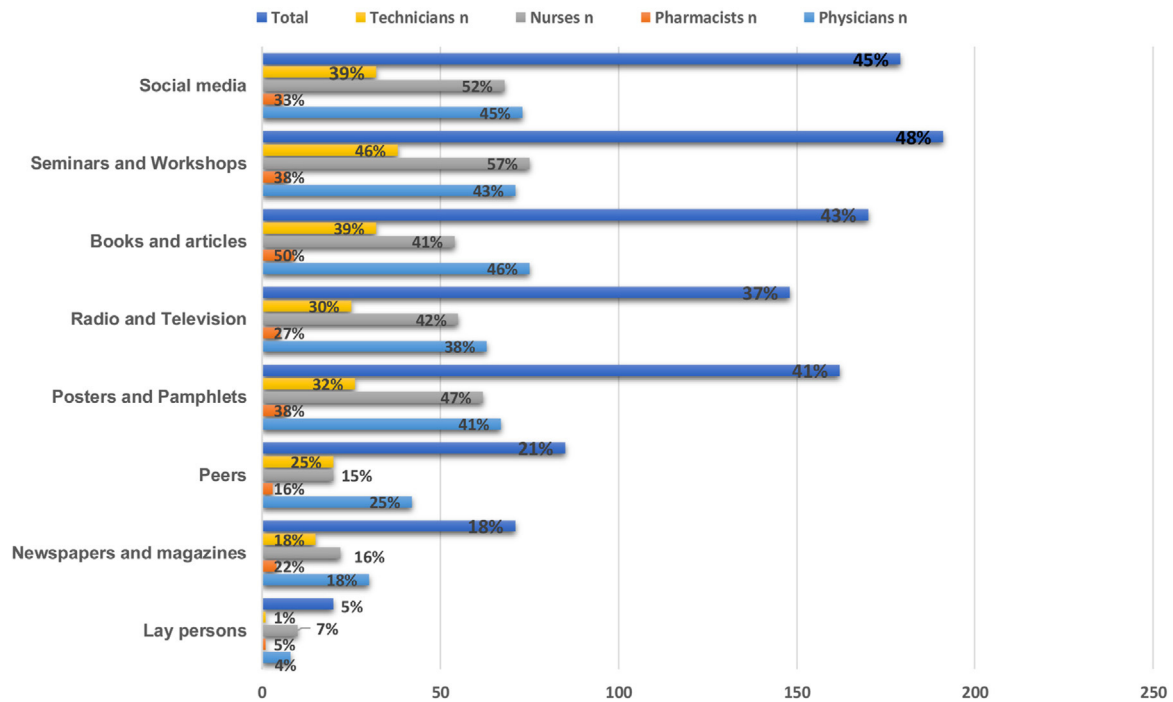


Fig. 1. Main source of MERS information showed by different health care professionals.

KNOWLEDGE OF HEALTH PROFESSIONALS

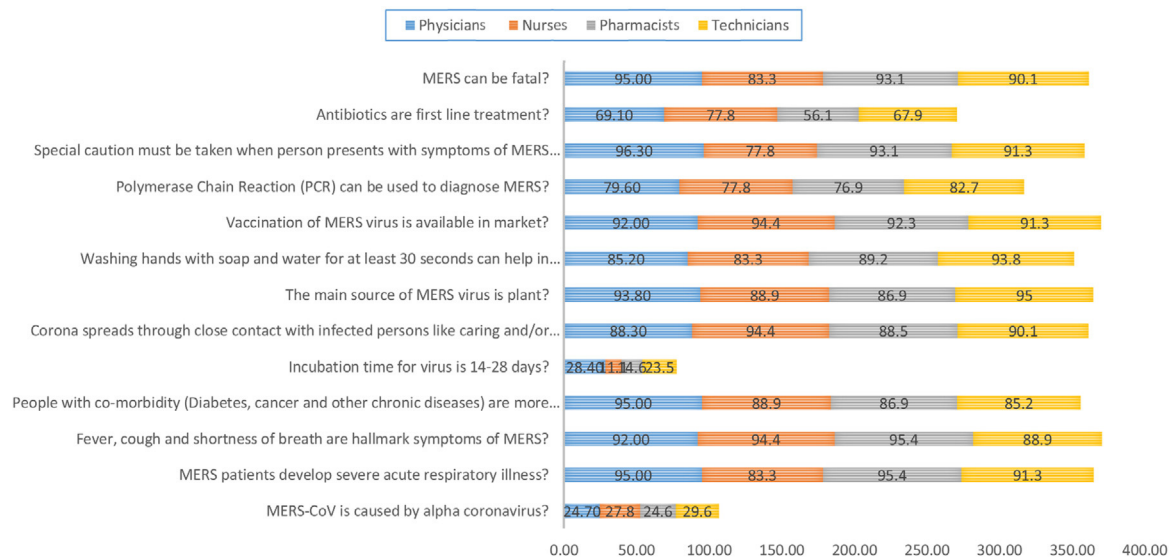


Fig. 2. Knowledge of healthcare workers towards MERS.

38.0%) and technicians (37; 20.2%) had more than five years of work experience in the KKHU hospital (Table 1).

Source of information

Results reported the highest main source of information as seminars and workshops (n = 191 (48%)); Physicians 71 (43%); pharmacist 7 (38%); nurses 75 (57%); and technicians 38 (46%) followed by social media (n = 179; 45%) and books and articles (n = 170; 43%). Fig. 1 shows the main source of MERS is information reported by different healthcare workers in the current study.

Knowledge and attitude of healthcare workers

Fig. 2 shows the knowledge of different healthcare workers. Almost 94% responded with correct answer to the question in which MERS patients develop severe acute respiratory illness followed by 93.3% to the question where special caution must be taken when a person presents with symptoms of MERS. All other questions showed correct answers between 80 to 90%. On the other hand, The study results showed most of the participants wrongly answered to the questions were incubation time for the virus is 14–28 days (78.0%) and MERS-CoV caused by an alpha coronavirus

Table 2
Mean score of knowledge and attitude of health care professionals N = 391.

Characteristics	Knowledge		P value	Attitude		P value
	Good N (%)	Poor N (%)		Good N (%)	Poor N (%)	
Physicians	155(95.7%)	7(4.3%)	0.039	156(96.3%)	6(3.7%)	0.273
Pharmacists	16(88.9%)	2(11.1%)		17(94.4%)	1(5.6%)	
Nurses	112(86.2%)	18(13.8%)		123(94.6%)	7(5.4%)	
Technicians	74(91.4%)	7(8.6%)		73(90.1%)	8(9.9%)	

ATTITUDE OF HEALTH PROFESSIONALS

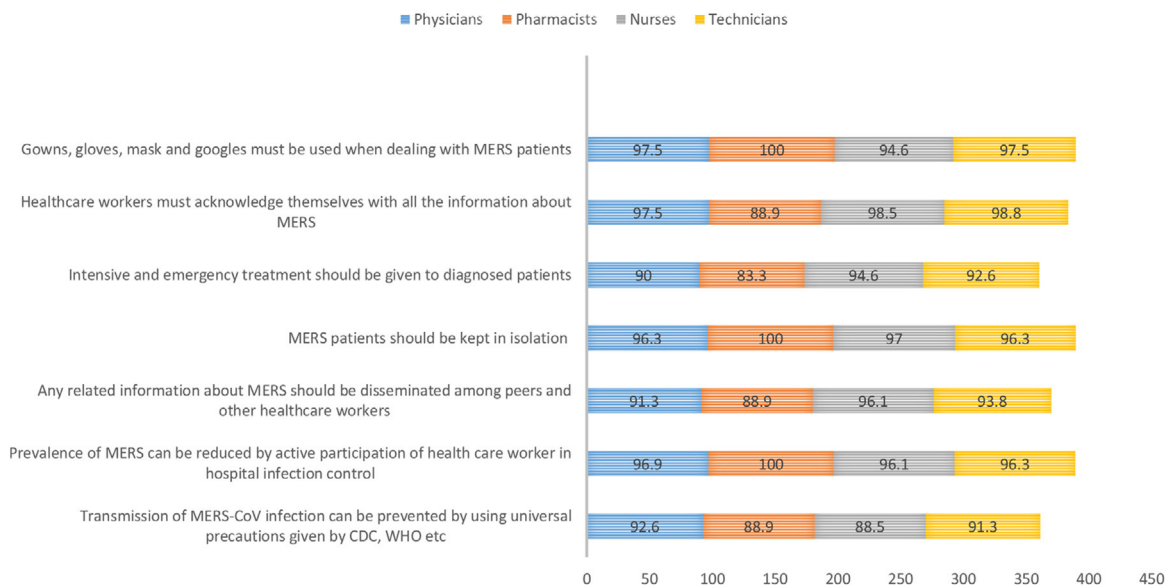


Fig. 3. Attitude of health care professionals towards MERS.

(74.2%) respectively. The overall score indicates good knowledge among physicians (95.7%), pharmacists (88.9%), nurses (86.2%) and technicians (91.4%) and showed statistically significant ($p = 0.039$) (Table 2).

Fig. 3 shows the attitude of different healthcare workers. A total of 382 (97.7%) of all category of healthcare workers agreed that workers must acknowledge themselves with all the information about MERS. Similarly, positive attitudes were observed regarding that “the prevalence of MERS reduced by active participation”, “MERS patients should be kept in isolated intensive and provide emergency treatment and gowns, gloves, the mask must be used when dealing with MERS patient” showed the same percentage of attitude (96.7%). The overall score showed positive attitudes among physicians (96.3%), pharmacist (94.4%), nurses (94.6%) and technicians (90.1%) and does not show any statistical significant ($p = 0.273$) (Table 2).

The practice of healthcare workers

Different healthcare workers practice towards MERS is shown in Table 3. The overall highest practice showed among healthcare participants were regarding throwing the used tissue in the trash 374(95.6%) (Physicians 155; 95.7%, pharmacist 18; 100.0%, nurses 126; 96.9%, and technicians 75; 92.6%). A lower percentage of practices were observed in using soap and water to wash hands 335 (85.7%) (Physicians 138; 85.2%, pharmacist 13; 72.2%, nurses 115; 88.5% and technicians 69; 85.2%). However, the least practice 95 (24.2%) among participants was the use of facemask in the crowds

(Physicians 35; 21.6%, pharmacists 5; 27.8%, nurses 37; 28.5% and technicians 18; 22.2%).

Other factors relations

The association of demographic characteristic features with different mean scores of knowledge and attitude shown in Table 4. Among studied demographic characteristic’s age, gender and professions showed significantly associated with mean knowledge score. However, the experience did not show any significant association with knowledge ($P = 0.301$). Similarly, statistical significance was observed in gender and experience demographic variables with a mean attitude score.

Discussions

The present study was designed to assess and compare the knowledge, attitude and practices of different healthcare workers toward MERS in the Riyadh region. This evaluation was essential among healthcare workers to improve the best clinical practices in managing the MERS infection, as so far there is no vaccine available nor any specific treatment being offered against MERS. In the current study, 391 healthcare workers participated and the response rate was 95.71% which is higher than the previous studies with similar subject conducted in Saudi Arabia [13,14].

One of the most significant findings in this study was that the highest main source of MERS information among different health care workers was seminars and workshops followed by social media. The Current study results strongly support the sim-

Table 3
Practice of health care professionals towards MERS N = 391.

Characteristics	Physicians			Pharmacists			Nurses			Technicians			Total (Yes)
	Yes N (%)	No N (%)	Sometimes N (%)	Yes N (%)	No N (%)	Sometimes	Yes N (%)	No N (%)	Sometimes	Yes N (%)	No N (%)	Sometimes	
Do you use soap and water wash your hands continuously?	138(85.2)	7(4.3)	17(10.5)	13(72.2)	1(5.5)	4(22.2)	115(88.5)	5(3.8)	10(7.7)	69(85.2)	3(3.7)	9(11.1)	335(85.7)
Do you cover your nose and mouth with a tissue during sneezing or coughing?	125(77.2)	11(6.8)	26(16.0)	14(77.8)	1(5.5)	3(16.7)	107(82.3)	6(4.6)	17(13.1)	64(79.0)	4(4.9)	13(16.0)	310(79.3)
Do you throw the used tissue in the trash?	155(95.7)	2(1.2)	5(3.1)	18(100.0)	0(0.0)	0(0.0)	126(96.9)	1(0.8)	3(2.3)	75(92.6)	3(3.7)	3(3.7)	374(95.6)
Do you avoid touching your eyes, nose or mouth as far as you can?	118(72.8)	8(4.9)	36(22.2)	10(55.5)	3(16.7)	5(27.8)	103(79.2)	5(3.8)	22(16.9)	61(75.3)	6(7.4)	14(17.3)	292(74.7)
Do you use face mask in crowds?	35(21.6)	89(54.9)	38(23.4)	5(27.8)	8(44.4)	5(27.8)	37(28.5)	65(50)	28(21.5)	18(22.2)	48(59.2)	15(18.5)	95(24.2)
Do you carefully handle a suspected patients belongings?	122(75.3)	18(11.1)	22(13.6)	13(72.2)	2(11.1)	3(16.7)	94(72.3)	15(11.5)	21(16.1)	64(79)	7(8.6)	10(12.3)	293(75.0)
Do you use a clean, nonsterile, longsleeved gown?	113(69.7)	27(16.7)	22(13.6)	13(72.2)	1(5.5)	4(22.2)	93(71.5)	16(12.3)	21(16.1)	56(69.1)	15(18.5)	10(12.3)	275(70.3)
Do you educate your patient about the disease?	105(64.8)	26(16.0)	31(19.1)	11(61.1)	1(5.5)	6(33.3)	90(69.2)	10(7.7)	30(23.1)	51(63.0)	18(22.2)	12(14.8)	257(65.7)

Table 4
Mean score of knowledge and attitude with different demographic characteristics.

	N	Knowledge score Median (Min.–Max.)	Mean rank	P-value	Attitude score Median (Min.–Max.)	Mean rank	P-value
Age							
≤29 y	176	10 (5–13)	182.18	0.05	4.5714 (3–5)	188.64	0.234
30–39 y	115	10 (5–13)	196.06		4.7143 (3.14–5)	192.03	
40–49 y	60	11 (6–13)	218.14		4.7143 (3.71–5)	222.03	
≥50 y	40	11 (8–12)	223.43		4.7143 (4–5)	200.73	
Gender							
Male	181	11 (5–13)	227.72	P < 0.0001	4.5714 (3.14–5)	183.88	0.046
Female	210	10 (6–13)	168.66		4.7143 (3–5)	206.45	
Professions							
Physician	162	11 (6–13)	211.14	0.07	4.7143 (3–5)	203.64	0.172
Pharmacist	18	10 (5–11)	181.08		4.4286 (3.86–5)	145.81	
Nurse	130	10 (5–13)	177.92		4.6429 (3.14–5)	190.02	
Technicians	81	10 (7–13)	198.05		4.7143 (3.43–5)	201.48	
Experience							
≤1 year	77	11 (5–13)	205.73	0.301	4.5714 (3–5)	168.45	0.073
1–3 years	61	10 (7–13)	184.68		4.7143 (3.71–5)	194.43	
3–5 years	69	10 (6–13)	178.48		4.8571 (3.29–5)	214.17	
≥5 years	184	10 (5–13)	202.25		4.7143 (3.14–5)	201.24	

ilar findings in which the main source of MERS was reported as the internet and social media [13,14]. This clearly indicates that health care workers are relying on the internet, social media and online information as the easiest ways to get the information compared with books, articles, and other resources. The Saudi Ministry of Health (MOH) and the World Health Organization (WHO) have provided cluster with MERS information through their websites and are recommending everyone to be aware of updates knowledge about MERS [4,5]. However, in terms of seminars, a previous study reported only 1% as a source of information when compared with the current study [14]. Such a big difference possibly explained by the fact that the MOH in Saudi Arabia has planned and conducted serieses of workshops and seminars in the hospitals and health care settings to avail with the most up-to-date information of MERS among different health care workers to update their knowledge, skills and understanding of viral infection. The least source of MERS reported in the current study was a layperson. Depending on a person without professional or specialized knowledge in MERS could lead to an adverse effect on the impact of healthcare in treating MERS cases which is strongly recommended for health care professionals not to rely on lay people as a source of information.

In this study, the overall mean knowledge scored among various health workers showed a good knowledge when comparing to poor knowledge of the participants and found statically significant ($p=0.039$). Interestingly, physicians showed higher knowledge levels of MERS when comparing with other workers such as technicians, pharmacist and nurses. Good knowledge level was clearly shown in response to the questions “MERS patients develop severe acute respiratory illness” (93.9%) and “special caution required when a person presents with symptoms of MERS” (93.3%). The outcomes of these questions are coincident with a similar study reported earlier [14]. All other answers to the remaining questions showed knowledge between 80 to 90% (Fig. 2). These results were of confidence that the healthcare workers are aware of MERS infection and its associated hygienic conditions. Possibly due to the Ministry of Health conducting successions of workshops and seminars resulting in leveraging health care professionals knowledge. Furthermore, most health care workers are utilizing social media and browsing the internet for online information as observed in the current study (Fig. 1.) These results are stimulating that most health care professionals are utilizing social media and internet to understand the diagnosis of MERS easily that can help in preventing the spread of diseases. Interestingly, 92% of health care professionals participated in the current study were knowledgeable that mean-

while, there is no vaccine available in the market and the research are still ongoing in various countries in developing a vaccination against MERS. Which indicates that health care professionals must take at most precaution in treating and preventing the virus, as there is no vaccine. The health care workers were least knowledgeable regarding the questions; incubation time for the virus is 14–28 days (78.0%) and MERS-CoV caused by an alpha coronavirus (74.2%) respectively. These percentages of response are much lower when compared with a similar study [14] and higher with another study [13], the incubation period will be prolonged up to two weeks in humans [16]. Interestingly, mostly physicians and nurses wrongly answered when compared with technicians and pharmacist that the MERS caused by an alpha coronavirus. This demonstrates that there was a disparity in the level of knowledge among the health care workers. This level of knowledge is in contradiction with other studies towards Severe Acute Respiratory Syndrome (SARS) [17]. In contrast, these results demonstrate that more priority towards these professions apart from the physician because they play key roles in improving health outcomes of MERS patient. This result also further encourages maintaining collaboration among health care professionals as teamworks in relation to clinical decision-making.

In the present study, participants showed a positive attitude towards MERS dealing with patients among health care professionals. The excellent response in our study to the positive attitude was that health care professionals must acknowledge themselves with all the information about MERS (97.7%) and using protective measures when dealing with MERS patients (96.7%). These results are the resemblance to other studies where it has reported a positive attitude regarding the use of protective equipment when dealing with MERS patient [14] and further goggles and gloves should be worn when dealing with healthcare associated infections [13,18]. Similarly, all other questionnaires related to attitude showed good response among healthcare workers and that agreed ranges between 90 to 96%. These results in the present study acknowledge that healthcare workers are increasing acquaintance and awareness about disease and protect themselves during the outbreak of the disease. Similar results reported in dealing SARS infectious diseases [19]. The findings in the present study also illustrate that there is no negative attitude towards MERS among participants. On the contrary, to the results, there was a negative attitude reported in different studies in dealing with MERS and SARS infectious diseases [13, 14, 20 and 21]. However, when comparing different health care professionals, physicians and nurses showed a good attitude, whereas pharmacist and technicians showed the least attitude and

do not show any statistical significant ($p = 0.273$) (Table 2). Different studies have shown a positive attitude of physicians when comparing different healthcare workers [14, 22, and 23]. This could be due to differences in the healthcare professional clinical knowledge compared between the workers.

The majority of healthcare workers showed average practice towards MERS infection. The overall highest practice were observed among healthcare participants were regarding throwing the used tissue in the trash 374 (95.6%) and using soap and water to wash hands 335 (85.7%). In a similar study reported 91.5% and 95.4% respectively [13]. In one study, it was found that healthcare workers washing hands were higher among nurses than other workers [24]. The spread of MERS infections can be controlled if health workers wash their hands at appropriate times with soap and water and maintaining good hygiene environment. However, the least practice among participants was the use of facemask in the crowds (24.2%). Similar results were reported, but with a higher percentage (83.3%) of using face mask [13]. This result is of a particular concern that though the workers have good knowledge and attitude, poor practice can lead to the spread of the infection in the community and further increasing mortality and morbidity. It was reported that personal protective equipment (PPE) helps prevent the spread of germs in the hospital and further protect people infections [25]. Therefore, it is important among different workers to adhere to the practice guidelines according to MOH and WHO intending the MERS infection in the community. The study further recommends healthcare workers to reinforce their knowledge and attitude that will eventually translate into good practice.

Overall, among the studied different demographic characteristic features, age, gender and professions showed significantly associated with mean knowledge score (Table 4). However, the experience did not show any significant association with knowledge. In comparisons to similar concepts, two studies reported in which age, specialty and experience were significantly associated with a mean knowledge score [13] and another study showed association with gender and experience [14]. Additionally, statistical significance observed in gender and experience with mean attitude score in the current study. A previous study showed a significant association between genders with practice score, but no significance with knowledge and attitude score were observed [13]. Another study reported, gender and experience were associated with attitude scores which support the findings of the present study results [14]. This difference may be due to differences in the professional and academic training of physicians compared with other workers. Further, physicians remain abreast of current recommendations from MOH and WHO and ensure proper treatment and prevention of MERS infection when compared with all other workers as shown in Figs. 2 and 3 and in Table 3. In terms of gender differences, it could be explained by Islamic traditional and cultural practices as males are more exposed to healthcare settings compared to females. Other studies have shown gender inequity in health education and public health sectors in Saudi Arabia can support the findings in the current study [26,27]. In contrast, the current study explores the positive correlation between knowledge and attitude of different health care professionals that is important in developing knowledge and understanding about MERS and leads to a positive attitude in treating MERS infection.

The strength of the current study could be observed in is the response rate which was higher when compared to previous studies [13,14] that address the major consequences related to MERS from the viewpoint of different health care professionals. In addition, the study demonstrates individual health care professionals (instead of merging all workers) in detailed about knowledge, attitude and practices towards MERS which suggest the ministry of health to focus independently. The single hospital sample may limit the generalization of the results and findings. Future research

should examine other additional factors reported other than in the current study.

The present study findings demonstrated that health care professionals participated in the study showed a good knowledge and a positive attitude towards dealing with MERS patients. However, showed low to average practice in the clinical settings when dealing with MERS patient that may affect and contribute to the rise in infections at hospitals. Among all health care professionals, physicians have a high degree of knowledge and attitude when compared to nurses, pharmacist and technicians. Such outcome from the current study has important implications for future interventions such as to improve self-care, coordination of care with MERS patient and educating with infection prevention and control guidelines of MERS. The present study also was able to identify specific elements in knowledge, attitude and practice gaps to address during the implementation of future awareness programs and the major practice issues that need emphasis among all workers. The study recommends the ministry of health authorities to promote MERS and its associated symptom's with a comprehensive training program consisting better structured targeting not only physicians but also among nurses, pharmacist and technicians in order to have equilibrium clinical knowledge about MERS.

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Competing interests

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