

Knowledge and attitudes towards Middle East respiratory syndrome-coronavirus (MERS-CoV) among health care workers in south-western Saudi Arabia

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Abstract

Background: Saudi Arabia is considered the epicentre of MERS-CoV. Since 2012, a total of 1844 cases of MERS-CoV have been reported. A recent cluster, with 8 cases, has been reported in Najran region in the south-western region of the country. This analysis of data from that region on health care workers (HCWs) awareness and attitudes towards the prevention and control of MERS-CoV may be useful when planning health education programmes about this emerging infectious disease.

Aims: We aimed to investigate the knowledge and attitude of HCWs toward MERS-CoV in south-western Saudi Arabia.

Methods: This cross sectional study was conducted on HCWs in primary health care centres and hospitals at Najran. A questionnaire containing 14 knowledge and 8 attitude items was completed by all 870 participants.

Results: Overall, > 80% of HCWs were aware about MERS-CoV etiology, mode of transmission, risk factors, and signs and symptoms. Knowledge scores revealed 51% of participants had sufficient knowledge. Physicians and nurses had significantly better knowledge compared with other HCWs ($P = 0.001$). Participants who worked at institutions with established infection control programme scored significantly better on knowledge questions ($P = 0.001$). Concerning attitude, > 70% of HCWs exhibited a positive attitude toward MERS-CoV.

Conclusion: the HCWs in Najran region showed a high level of knowledge and positive attitude toward MERS-CoV. There was a noticeable difference in knowledge level between different professions. Periodic educational interventions and professional campaigns are still needed. Any interventions should be directed towards the non-physician and non-nursing professions.

Keywords: MERS-CoV; health care workers; knowledge; attitudes, infection control

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Introduction

Two strains of coronavirus have been found to infect humans: severe acute respiratory syndrome-coronavirus, SARS-CoV, and Middle East respiratory syndrome-coronavirus MERS-CoV (1). In September 2012, the first case of MERS (the index case) was reported in Saudi Arabia. Soon afterwards, a patient from Qatar who had visited Saudi Arabia began experiencing acute respiratory symptoms and renal failure. The symptoms and type of virus described in these 2 patients were similar (2).

As of May 2018, a total of 2220 laboratory-confirmed cases, including 790 deaths (case-fatality rate 35.6%), have been reported to the World Health Organization (WHO) from a total of 27 countries. The majority of cases have been reported in the Middle East (3). Transmission has most commonly been associated with nosocomial outbreaks (4–8).

Saudi Arabia is considered the epicentre of MERS-CoV. Since 2012, a total of 1844 cases of MERS-CoV have been reported, with 716 related deaths and a case-fatality

rate of approximately 38.8% (3). Between January through May 2018, the Ministry of Health reported 75 laboratory confirmed cases with 23 deaths occurring in 4 distinct clusters (2 health care and 2 household clusters) in different regions of the country. Among these recent clusters, a household cluster was reported from Najran region with 8 reported cases, and the source of infection is believed to be camels at the initial patient's home (3,9). This epidemiologic pattern poses great public health challenge to the local health authorities and health care sectors in view of the fact that Saudi Arabia traditionally hosts large gatherings such as the Hajj pilgrimage (10–12).

So far, no vaccine has been developed for MERS and no antiviral treatment is specifically recommended. Therefore, applying preventive measures to reduce the spread of the disease is of the utmost importance (13). The WHO and the Centers for Disease Control and Prevention (CDC) have published recommendations for the prevention and control of MERS infection in health care settings (14). This includes hand hygiene, wearing personal protective equipment, and patient placement (15).

Given the mode of MERS transmission, health care workers (HCWs) in contact with MERS patients are expected to be at a high risk of infections. Previous clinical studies have shown that the seroprevalence of MERS-CoV among HCWs who had had contact with MERS patients ranged from 0.3% to 20.9%. Therefore, use of personal protective equipment is crucial to reducing transmission. Gowns and gloves are recommended as a contact precaution, and surgical masks are recommended as a droplet precaution (16–19). However, these effective infection prevention and control practices depend on awareness and compliance among HCWs at all levels (15). A poor level of knowledge has been implicated in the rapid spread of the infection in hospitals (18). Despite many previous Saudi Arabian studies examining the knowledge and practices in regard to MERS among HCWs in different regions of the country (10,11,20,21), data from the south-western region are scarce. In addition, HCWs represent a major section of the Saudi Arabian population and constitute a considerable source of infected cases in the country (16,17). Najran region alone has 7 general hospitals and 55 primary health care centres, with a total of 3320 HCWs, including 784 physicians and 1842 nurses, according to the Ministry of Health statistics (9).

This study aimed to investigate the knowledge and attitude of HCWs toward MERS infection in south-western Saudi Arabia. The findings may be useful in recommending any remedial measures and additional interventions in the study area to improve awareness and attitudes among HCWs.

Methods

Sample

This cross-sectional, descriptive study of a representative sample of Saudi HCWs (physicians, dentists, pharmacists, nurses and laboratory staff) in primary health care centres and hospitals in Najran, a city in south-western Saudi Arabia, was conducted from June to October 2016. The study was conducted according to the international guidelines of Strengthening the Reporting for Observational Studies in Epidemiology; STROBE (22). The sample size required for the study was estimated to be 685, based on an average previous estimate of 54% MERS awareness among Saudi HCWs (10), with an absolute precision of 2% and at a 95% confidence interval. To avoid loss of participants, a total sample of 870 HCWs was included in the present study. A stratified proportional allocation random sample was used. The stratification factors taken into consideration were the age, sex, type of health care speciality and relative number and type of health care facility.

The study followed the principles of the Helsinki Declaration and ethical approval was obtained from the ethics and research committee of Najran University. Written consent was obtained from all participants.

Questionnaire interview

A standardized questionnaire was distributed and completed by all participants inside their health care facilities

(primary health care centres and hospitals) during the first 2-month period of the study. The self-administered questionnaire was developed, with some modifications, using the frequently asked questions from the WHO and the Saudi Ministry of Health websites (9,23).

The questionnaire was initially designed in English and translated into Arabic by experts in infectious diseases and biostatistics to match with the local colloquial Arabic terminology used by physicians and health educators in the community. After translation and back translation (24), the questionnaire was pilot tested on 20 HCWs (7 doctors, 6 nurses and 13 technicians) who are not included among the study participants to determine acceptability and the clarity of the questions, and to confirm its face validity; it was then modified accordingly.

The questionnaire comprised 3 parts addressing knowledge and attitude of HCWs regarding MERS. The first part covered demographic data such as age, sex, current job and participants' source of knowledge on MERS (6 items). The second part assessed the knowledge of HCWs by asking questions about the etiology, incubation period, symptoms, risk group, consequences, source of transmission, prevention and treatment of MERS (11 items). A scoring system was applied to assess the level of knowledge of each subject, as has been previously used (with some modifications) (11): 2 points for each correct answer, 1 point for an incorrect answer. A total of ≥ 12 points ($\geq 60\%$ of total marks) was considered sufficient knowledge. Participants were grouped into 2 categories according to their level of knowledge: insufficient (< 12 points), and sufficient (≥ 12 points). The third part of the questionnaire assessed the attitude of HCWs regarding MERS using a set of 8 yes/no questions.

Statistical analysis

Data were coded, validated and analysed using SPSS, version 22. Frequencies and proportions were used to present the data. Chi-squared was used as the test of significance at the 5% level.

Results

A total of 820 HCWs completed the questionnaire, a response rate of 94.3%. The age range of the participants was 23–58 years, median (IQR) 31 (28–38) years and mean 33.7 (standard deviation 8.6) years. Table 1 shows the baseline characteristics of the respondents. More than two-thirds (563) were male. The study group included 200 (24.4%) nurses, 185 (22.6%) physicians and 435 (53.0%) other HCWs; 132 (71.4%) physicians and 124 nurses worked in primary health care centres. More than half of the respondents 476 (58%) perceived that they had sufficient knowledge about MERS. The main sources of MERS information were the Ministry of Health website 410 (50.0%) and social media 296 (36.1%).

Table 2 shows the current status of MERS knowledge among HCWs. The majority, 762 (92.9%), were aware that the disease is a viral infection, 748 (91.2%) were familiar with its mode of transmission and 688 (83.9%) with the signs and symptoms. A majority of participants agreed

Table 1 Baseline characteristics of health care workers, Najran, 2016

Characteristic	Participants (n = 820) No. (%)
Sex	
Male	563 (68.7)
Female	257 (31.3)
Age (years)	
21–30	338 (41.2)
31–40	326 (39.8)
41–50	120 (14.6)
50	36 (4.4)
Occupation	
Nurse	200 (24.4)
Physician	185 (22.6)
Pharmacist	148 (18)
Technician	105 (12.8)
Dentist	102 (12.4)
Laboratory worker	60 (7.3)
Do you have sufficient knowledge about MERS-CoV?	
Yes	476 (58.0)
No	322 (39.3)
Don't know	22 (2.7)
Source of knowledge about MERS-CoV	
Ministry of Health website	410 (50.0)
Social media	296 (36.1)
Newspaper	72 (8.8)
TV	42 (5.1)

that patients with chronic diseases [760 (92.7%)] and HCWs [692 (84.4%)] are at a higher risk of infection. However, the participants' knowledge about questions related to MERS vaccination, treatment by antibiotics, diarrhoea as a possible symptom, and the incubation period was poor.

The knowledge scores were correlated against the baseline characteristics of the respondents (Table 3). Females had statistically significantly better knowledge than males ($P = 0.002$). Sufficient knowledge was significantly correlated with age ($P = 0.001$). Moreover, physicians and nurses had significantly better knowledge compared with other HCWs ($P = 0.001$). As expected, HCWs at institutions with established infection control programmes scored significantly better ($P = 0.001$).

Over 70% of HCWs exhibited a positive attitude toward MERS. The majority of participants (79%) knew that MERS infection could be prevented by using isolation and standard precautions. Besides, 88.4% felt that the information in Saudi society was sufficient to deal with MERS and 95.7% that their institutions would be able to control any emerging MERS epidemic (Table 4).

Discussion

Currently, MERS is a daily discussion topic in the media and among the public, especially among patients and HCWs. This analysis of data from south-western Saudi Arabia tries to inform on awareness and attitudes towards the prevention and control of MERS among HCWs: our findings may be useful when planning health education programmes about this emerging infectious disease.

We found that 50% of the participants depended on the Ministry of Health website as a main source of information about MERS. This differs from the findings of previously published studies, where social media and television were the main sources of information (11,13,19–21,25). This indicates that the educational materials posted online by the Ministry of Health encouraged the busy HCWs to use them. At the same time, it sets a great responsibility on health care authorities to increase the accessibility of such materials by varying the means of information delivery, aiming to improve knowledge levels. A finding of considerable concern is that 36% of HCWs used social media as a source of information. Because of the difficulty in determining the validity and scientific content of information sources as well as the possibility of misinformation being presented, HCWs should practice careful evaluation of MERS-related educational materials (1).

The findings of this study suggest a good relationship between information available in the media about MERS and the depth of knowledge among HCWs. For example, about 97% of the participants knew about the preventive measures, 92.9% about the causative agent of the disease, 91% about the mode of transmission, and 83.9% about the clinical symptoms. These results are consistent with findings from previous studies (11,13,25,26). On the other hand, fewer participants were knowledgeable about diarrhoea as a symptom of disease, vaccine availability and the incubation period.

As per CDC recommendations, Saudi Arabia has led the relevant authorities to initiate educational campaign targeted towards HCWs. These mainly focused on the prevention, treatment and symptoms of MERS (9,15). Nevertheless, greater encouragement is needed for HCWs to refer to the Ministry of Health websites.

In this study, only 51% of participants had sufficient knowledge about MERS. Such unsatisfactory results highlight the need for greater efforts to raise general awareness among HCWs about MERS. As expected, age was significantly associated with higher proportions of sufficient knowledge. A number of previous studies also found that older HCWs showed higher rates of knowledge and awareness (11,20,27).

We found that there was variability among HCWs in their knowledge level. For example participants who worked in places where a preventive programme and infection control policies are applied had greater levels of sufficient knowledge than those working in places without an infection control programme. Physicians

Table 2 Knowledge about MERS-CoV among health care workers, Najran, 2016

Question (correct answer)	Correct answer No. (%)
MERS-CoV is a viral infection (Yes)	762 (92.9)
MERS-CoV is transmitted by close contact with infected person or animal (Yes)	748 (91.2)
Fever, cough and shortness of breath are symptoms of MERS (Yes)	688 (83.9)
Diarrhoea is a possible symptom of MERS (Yes)	504 (61.5)
The incubation period is 2–4 weeks (No)	484 (59.0)
MERS-CoV vaccine is available in markets (No)	564 (68.8)
Antibiotics are the first-line treatment (No)	588 (71.7)
Washing hands with soap and water can help in prevention of disease transmission (Yes)	796 (97.1)
Patients with underlying chronic diseases are at a higher risk of infection (Yes)	760 (92.7)
Health care workers are at a higher risk of infection (Yes)	692 (84.4)
MERS could be fatal (Yes)	666 (81.2)

Table 3 Distribution of knowledge scores among health care workers in Najran, 2016

Characteristic	Sufficient knowledge (n = 416) No. (%)	Insufficient knowledge (n = 404) No. (%)	Total (n = 820)	P-value
Sex				
Male	216 (38.4)	247 (60.7)	463	0.002
Female	200 (77.8)	57 (22.2)	257	
Age (years)				
21–30	84 (24.9)	254 (75.1)	338	0.001
31–40	214 (50.2)	112 (48.8)	326	
41–50	96 (80)	24 (20)	120	
> 50	26 (72.2)	10 (27.8)	36	
Occupation				
Nurse	158 (79)	42 (21)	200	0.001
Physician	146 (78.9)	39 (21.1)	185	
Pharmacist	70 (47.3)	78 (52.7)	148	
Dentist	6 (5.9)	96 (94.1)	102	
Technician	36 (34.3)	69 (65.7)	105	
Laboratory worker	0	60 (100)	60	
Presence of animals				
Yes	124 (58.5)	88 (41.5)	212	0.117
No	292 (48.8)	306 (51.2)	598	
Don't know	0	10 (100)	10	
Do you have sufficient knowledge about MERS-CoV?				
Yes	324 (68.1)	152 (31.9)	476	0.082
No	82 (25.5)	240 (74.5)	322	
Don't know	10 (16.1)	52 (83.9)	62	
Have you had previous contact with MERS patients?				
Yes	76 (52.1)	72 (47.9)	148	0.428
No	340 (53.3)	298 (46.7)	638	
Don't know	0	34 (100)	34	
Presence of prevention programme				
Yes	386 (88.5)	284 (70.3)	670	0.001
No	16 (3.8)	36 (8.9)	52	
Don't know	14 (3.4)	84 (20.8)	98	

Table 4 Attitude of health care workers toward MERS-CoV, Najran, 2016

Item (correct answer)	Response No. (%) ^a
Are you worried one of your family members may get an infection?	
Yes	570 (69.5)
Transmission of MERS can be prevented by using standard and isolation precautions given by CDC, WHO, APIC, etc? (Yes)	
Yes	647 (78.9)
Prevalence of MERS can be reduced by active participation of health care worker in hospital infection control programme? (Yes)	
Yes	605 (73.8)
If a MERS-CoV vaccine were available, would you have it?	
Yes	638 (77.8)
Intensive treatment should be given to diagnosed patients? (Yes)	
Yes	778 (94.9)
Health care workers must avail themselves of all information about the virus? (Yes)	
Yes	762 (92.9)
Is the available information about MERS-CoV in Saudi society sufficient?	
Yes	725 (88.4)
Are the government institutions able to control the epidemic?	
Yes	785 (95.7)

CDC = Centers for Disease Control and Prevention, WHO = World Health Organization, APIC = Association for Professionals in Infection Control and Epidemiology.

^aAll respondents answered either yes or no. There were no missing values or don't know responses.

and nurses had better knowledge levels than other professions, as seen elsewhere (20,28,29). Any upcoming educational programmes could be designed to target those professions which demonstrated a greater incidence of insufficient knowledge level, i.e. in our study this included dentists, pharmacists, technicians and laboratory personnel.

Those HCWs who had previous contact with infected patients showed a high level of insufficient knowledge, which is an unexpected result and points to the importance of health care authorities setting up awareness campaigns for patient contacts which also include their managing health team.

Generally, most participants had a positive attitude towards active participation in infection control programmes and the role of guidelines in prevention of the infection. They believed in the ability of the government to control an epidemic. However, 22.2% showed negative attitudes towards vaccination. This could be explained by a lack of proper knowledge about the preventive role of active immunization.

Although the majority of respondents were not able to determine their actual knowledge level, about 93% believe that HCWs must avail themselves of all information about the virus. The majority agreed that patients infected with MERS should be intensively treated. Moreover, almost 70% of our participants were worried about MERS infection for their family. Similar findings have been reported in many previous studies (20,26,27).

This study had some limitations. Firstly, the questionnaire data may have been subject to recall bias and misclassification. However, we can expect that HCWs have the necessary medical knowledge to correctly respond to all items of the questionnaire tool. Secondly, our study was limited to the south-western region of Saudi Arabia, thus the results presented here may not be generalizable to the rest of the country. Finally, the lack of detailed information about the attitude of HCWs towards MERS is a potential limitation. Therefore, carrying out further large-scale studies from other regions in Saudi Arabia is important to further explore awareness and attitude of HCWs at the national level.

Conclusion

The HCWs in Najran region showed a high level of knowledge and positive attitudes towards MERS. However, there is a noticeable difference in knowledge level between the professions. Periodic educational interventions using locally-adjusted methods are indicated as these could contribute to improving any deficiencies in knowledge, e.g. the incubation period, and diarrhoea as a possible symptom. Greater educational efforts about prevention should be directed to dentists, technicians, pharmacists and laboratory workers, and patient contacts (including the treating team) should be more involved in the process of education about infectious diseases.

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Competing interests: None declared.

Connaissances et attitudes vis-à-vis du coronavirus du syndrome respiratoire du Moyen-Orient (MERS-CoV) parmi les agents de santé dans le sud-ouest de l'Arabie saoudite

Résumé

Contexte : L'Arabie saoudite est considérée comme étant l'épicentre du MERS-CoV. Depuis 2012, un total de 1844 cas de MERS-CoV ont été déclarés. Récemment, un groupe de huit cas a été notifié dans la région de Najran dans le sud-ouest du pays. La présente analyse des données de cette région portant sur le niveau de sensibilisation et les attitudes des agents de santé vis-à-vis de la lutte contre le MERS-CoV et de sa prévention peut être utile dans le cadre de la planification des programmes d'éducation sanitaire concernant cette maladie infectieuse émergente.

Objectifs : Notre objectif était d'examiner les connaissances et les attitudes des agents de santé vis-à-vis du MERS-CoV dans le sud-ouest de l'Arabie saoudite.

Méthodes : La présente étude transversale a été menée auprès d'agents de santé dans les centres de soins de santé primaires et les hôpitaux de Najran. Un questionnaire contenant 14 items sur les connaissances et 8 items sur les attitudes a été rempli par les 870 participants.

Résultats : Globalement, plus de 80 % des agents de santé avaient des connaissances sur l'étiologie, le mode de transmission, les facteurs de risque ainsi que sur les signes et les symptômes du MERS-CoV. Les scores de connaissance ont montré que 51 % des participants avaient un niveau suffisant. Les médecins et les personnels infirmiers présentaient un niveau de connaissance significativement plus élevé que les autres aux agents de soins de santé ($p = 0,001$). Les participants qui travaillaient dans des institutions dotées d'un programme de lutte contre les infections bien établi obtenaient des scores significativement plus élevés aux questions portant sur les connaissances ($p = 0,001$). S'agissant des attitudes, plus de 70 % des agents de santé ont montré une attitude positive vis-à-vis du MERS-CoV.

Conclusion : les agents de santé de la région de Najran faisaient preuve d'un niveau élevé de connaissances et avaient une attitude positive vis-à-vis du MERS-CoV. On a observé une différence non négligeable concernant le niveau de connaissances entre les différentes professions. Des interventions éducatives et des campagnes périodiques à l'intention des professionnels demeurent nécessaires. Toute intervention devrait cibler les membres du personnel soignant qui ne sont ni médecins ni infirmiers.

معلومات واتجاهات العاملين في مجال الرعاية الصحية تجاه فيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية في جنوب غرب المملكة العربية السعودية

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الخلاصة

الخلفية: تُعدُّ المملكة العربية السعودية بؤرة لفيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية. ف منذ عام 2012، بلغ عدد الحالات الإجمالية المبلغ بها والمصابة بفيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية 1844 حالة. وأبلغ مؤخرًا عن مجموعة تضم 8 حالات في منطقة نجران جنوب غربي البلاد. وقد يكون هذا التحليل للبيانات المستمدة من تلك المنطقة عن وعي عاملي الرعاية الصحية ومواقفهم تجاه الوقاية من فيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية ومكافحته مفيدًا في التخطيط لبرامج التنقيف الصحي المعنية بهذا المرض المعدية.

الأهداف: هدفنا استقصاء معلومات واتجاهات العاملين في مجال الرعاية الصحية في جنوب غربي المملكة العربية السعودية نحو فيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية.

طرق البحث: أجريت هذه الدراسة المقطعية على العاملين في مجال الرعاية الصحية في مراكز ومستشفيات الرعاية الصحية الأولية في نجران. واستُكمل استبيان يتألف من 14 بندًا للمعلومات و 8 بنود تتعلق بالاتجاهات بواسطة جميع المشاركين في الاستبيان البالغ عددهم 870 مشاركًا.

النتائج: بصورة عامة، تجاوزت نسبة العاملين في الرعاية الصحية الملمين بسبب الإصابة بفيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية، وطريقة انتقاله، وعوامل الخطر المرتبطة به، وعلاماته، وأعراضه نسبة 80%. وأوضحت الدرجات المعرفية أن 51% من المشاركين كانت لديهم معلومات كافية عن الفيروس. وكان لدى الأطباء وطواقم التمريض معلومات أفضل بكثير مقارنة بسائر العاملين في الرعاية الصحية ($p = 0.001$). وحقق المشاركون الذين عملوا في مؤسسات بها برامج راسخة لمكافحة العدوى درجات أفضل بكثير فيما يتعلق بأسئلة المعلومات ($p = 0.001$). وفيما يتعلق بالاتجاهات، فقد أظهر ما يزيد عن 70% من العاملين في الرعاية الصحية موقفًا إيجابيًا إزاء فيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية.

الاستنتاج: أظهر العاملين في الرعاية الصحية في منطقة نجران مستوى معلومات مرتفعًا واتجاهات إيجابية تجاه فيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية. كانت هناك اختلافات ملحوظة في مستوى المعلومات بين مختلف المهن. ولا تزال الحاجة ماسة إلى القيام بتدخلات تنقيفية دورية وحملات للتوعية المهنية. وينبغي توجيه أي تدخل نحو باقي المهن غير الطبية والتمريضية.

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