

Original Article

## Middle East respiratory syndrome coronavirus (MERS-CoV) outbreak perceptions of risk and stress evaluation in nurses

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### Abstract

**Introduction:** Saudi Arabia was affected by an outbreak of Middle East respiratory syndrome coronavirus (MERS-CoV). We aimed to determine the perception of risk and level of stress among nurses.

**Methodology:** A questionnaire survey was administered to determine the perceptions of risk of MERS-CoV infection.

**Results:** The majority of the participants were females (332; 86.0%), and there were 54 (14.0%) males. Of the 386 respondents, nurses constituted the majority of the respondents (293; 75.9%), and there were 34 doctors (8.8%). The percentage of exposure was found to be greater in those who were working in the intensive care unit (ICU) (89; 23%). There was a significant difference in the worry and fear scale of contracting the MERS-CoV infection between participants who worked in isolation areas, ICUs, and emergency rooms (mean:  $3.01 \pm 1.1$ ) compared to participants who worked in areas that are less likely to admit and have MERS-CoV suspected or positive cases (mean:  $2.77 \pm 1.1$ ;  $p = 0.031$ ). Females were significantly more worried and fearful of contracting the virus compared to males (mean:  $2.92 \pm 1.1$  versus  $2.61 \pm 1.0$ , respectively;  $p = 0.045$ ).

**Conclusions:** MERS-CoV caused a relatively significant level of distress among nurses. There was a difference in the worry and fear scale of contracting the MERS-CoV infection between participants who worked in areas likely to admit and have MERS-CoV suspected or positive cases. After the campaign, the level of confidence got higher and the participants were more adherent to the infection control precautions.

**Key words:** Coronavirus; outbreak; nurses.

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### Introduction

Middle East respiratory syndrome coronavirus (MERS-CoV), a novel human coronavirus that caused outbreaks of a severe acute respiratory syndrome (SARS)-like illness in the Middle East, is now considered a threat to global public health [1].

MERS-CoV was first reported in September 2012, when a novel betacoronavirus was isolated from a Saudi Arabian patient in Jeddah who had died of severe pneumonia [2].

A large number of MERS-CoV cases (229 cases) were reported between 11 April 2014 and 4 May 2014 by Saudi Arabia from Jeddah. The World Health Organization (WHO) Emergency Committee concluded that the increase in cases reported among

healthcare workers from hospitals in Jeddah was amplified due to overcrowding and inadequate infection control measures [3,4]. A MERS-CoV outbreak is unique in recent history in its rapidity of transmission, its concentration in healthcare settings, and the large number of healthcare workers who have been infected [5]. In this paper, we aimed to describe the perceptions of risk and stress impact of a MERS-CoV outbreak on nurses.

### Methodology

The questionnaire consisted of three parts: (1) individual characteristics, including job title, age, length of working experience, gender, marital status, number of children, religion, and living arrangements;

(2) 88 questions comprising single choice, multiple choice, and open-ended questions pertaining to the perception of exposure to SARS, perceived risk of infection, and impact of the SARS outbreak on personal and work life; and (3) impact of events scale (IES) (Horowitz, Wilner and Alvarez, 2000)[6] which measures the intrusive and avoidance items made by people during stressful life events. The responses were recorded on a 6-point Likert scale (1 strongly disagree, 6 strongly agree) with scores of 1 to 3 taken as indicative of negative response, and 4 to 6 as positive response. The scores obtained for the intrusion avoidance items in the IES were divided into high or low scores, using the median score as the cut-off point.

*Ethics*

The study was approved by the ethical institutional review board of the College of Medicine, King Saud University.

*Statistics*

Data were analyzed using SPSS version 11.0 (SPSS Institute, Chicago, USA), and the simple difference method was used to derive the odds ratio (OR) between groups for each covariate of interest. Bivariate statistics and multiple logistic regression were employed to assess the role of each of the independent variables on selected dependent variables.

**Results**

A total of 398 medical staff were invited to participate in the survey, and 386 responded. The response rate was 96.9%. There were 54 (14.0%) males and 332 (86.0%) females. The mean age of the participants was 35.5 ± 9.8 years (range, 23 to 60 years). Of the 386 respondents, 293 (75.9%) were nurses, 34 (8.8%) were doctors, 19 (4.9%) were healthcare assistants, 12 (3.1%) were medical interns, 12 (3.1%) were respiratory therapists, 8 (2.1%) were radiology technicians, 2 (0.5%) were dieticians, 1 (0.3%) was a faculty member, 1 (0.3%) was a pharmacist, 1 (0.3%) was a secretary, and 3 (0.8%) were other medical staff (Figure 1).

There were 64 (16.6%) participants who were in contact with corona-infected patients, 164 (42.5%) who had been in contact with suspected MERS-CoV cases screening-negative patients, and 158 (40.9%) who had had no contact with a suspected or infected MERS-CoV patient (Figure 2).

There were 104 (26.9%) participants who considered rescheduling or changing their annual leave (vacation from work) to an earlier time to avoid contact

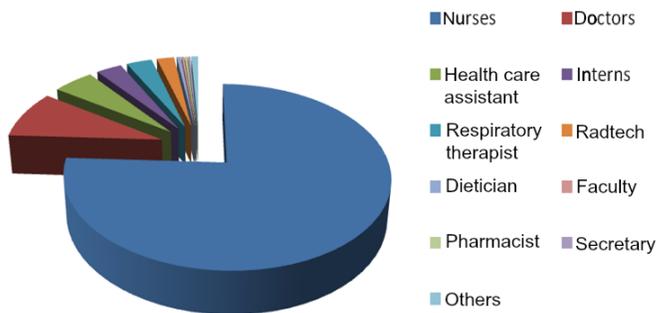
with MERS-CoV patients; it is worth mentioning that most expatriate staff prefer to go for their vacation during the summer. The majority of the participants (252; 65.3%) had their influenza vaccination yearly, whereas 30 (7.8%) had their flu vaccine just this year. There were 104 (27.0%) participants who had never had any flu vaccination.

There were 112 (29.0%) participants who strongly agreed that fear of MERS-CoV increased public awareness, whereas 215 (55.7%) agreed, 20 (5.2%) neither agreed or disagreed, 22 (5.7%) disagreed, and 17 (4.4%) strongly disagreed.

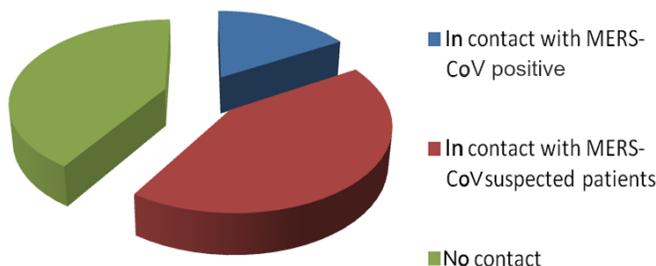
Using a scale from 1 to 5, participants were asked to rate how much they had worried over the past weeks about contracting MERS-CoV; 30 (7.8%) were extremely worried, 79 (20.5%) were very worried, 125 (32.4%) were somewhat worried, 106 (27.5%) were a little worried, and 46 (11.9%) were not worried at all.

Using a scale from 1 to 5, participants were also asked to rate how much worry they had experienced over the past four weeks prior to when the survey was administered about transmitting MERS-CoV infection from the hospital to one of their family members or friends; 47 (12.2%) were extremely worried, 81 (21.0%) were very worried, 112 (29.0%) were somewhat worried, 103 (26.7%) were a little worried, and 43 (11.1%) were not worried at all.

**Figure 1.** Distribution of healthcare workers by specialty.



**Figure 2.** Distribution of healthcare workers by proximity (contact) to suspicious/MERS-CoV infected subjects.



There were no significant differences in the worry scale on fear of contracting and transmitting MERS-CoV between participants who had direct contact with a MERS-CoV patient and those who did not have direct contact with a MERS-CoV patient (mean:  $2.92 \pm 1.1$  versus  $2.81 \pm 1.0$ ;  $p = 0.349$ , and mean:  $3.04 \pm 1.2$  versus  $2.91 \pm 1.1$ ;  $p = 0.273$ , respectively).

However, there was a significant difference in the worry and fear scale of contracting the MERS-CoV infection between participants who worked in isolation areas, intensive care units (ICUs), and emergency rooms (mean:  $3.01 \pm 1.1$ ) compared to participants who worked in non-isolation areas and areas that are less likely to admit and have MERS-CoV suspected or positive cases (mean:  $2.77 \pm 1.1$ ;  $p = 0.031$ ). There was no significant difference in the worry and fear scale of transmitting the infection between participants who worked in isolation areas versus those who worked in non-isolation areas (mean:  $3.12 \pm 1.2$  versus  $2.89 \pm 1.1$ ;  $p = 0.068$ ).

Females were significantly more worried and fearful of contracting the virus compared to males (mean:  $2.92 \pm 1.1$  versus  $2.61 \pm 1.0$ ;  $p = 0.045$ ). There were no significant differences between genders in the worry scale about transmitting the virus (mean:  $3.02 \pm 1.2$  versus  $2.75 \pm 1.1$ ;  $p = 0.074$ ).

## Discussion

As of 30 September 2014, there were a global total of 887 laboratory-confirmed cases of MERS-CoV infection reported, including 352 deaths. Nearly all of these cases (865/887; 97.5%) occurred in the Middle East [7]. Of these, 85.0% (754 cases) were reported in Saudi Arabia [8]. In a study by Saad *et al.* reporting on 70 consecutive patients with MERS-CoV in Saudi Arabia, 55% (39/70) were defined as being associated

with healthcare [9]. In this study, we recorded a high survey response rate of 96.9%. The majority of the participants were female (332; 86.0%), and 54 were males (14.0%). Of the 386 respondents, nurses constituted the majority of the respondents (293; 75.9%). Doctors were 34 of the respondents (8.8%), and the other respondents (constituting 15.3%) were other medical staff (interns, radiologists, physiotherapists). Most of the participants worked in non-ICU areas (146; 37.8%). Fifty respondents worked in an emergency room (13%), 89 worked in an ICU (23%), and only 17 worked in an isolated area (4.4%).

Sixty-four participants (16.6%) were in contact with corona-infected patients, almost 164 of the participants (42.5%) were in contact with patients who were suspected of harboring corona, and 158 participants (40.9%) had no contact with a suspected or infected coronavirus patient. A total of 104 (26.9%) of the participants considered rescheduling/changing their time to avoid contact with coronavirus patients.

A study in Hong Kong focused on 271 healthcare workers (HCWs) from SARS units and 342 healthy control subjects. Using the perceived stress scale to assess stress levels, they found that stress levels were increased in both groups [10].

We noted significant changes with respect to infection-control issues such as an increase in compliance with hand hygiene at the hospital and compliance with universal precautions (masks and gloves). However, in terms of other issues related to infection such as a decrease in social visits, a decrease in handshaking habits, and a decrease in the use of public facilities, 77 of the participants (19.9%) did not change their attitudes towards social visits (Table 1).

In a systematic review, it was found that HCWs' perceptions of risk can influence their behavior towards

**Table 1.** Different opinions of the participants when asked about changes observed during the outbreak of MERS-CoV and infection control issues

	Extensive change	Moderate change	Little change	No change
Increase in compliance with hand hygiene at the hospital	280 (72.5)	76 (19.7)	20 (5.2)	10 (2.6)
Increase in compliance with universal precautions (masks and gloves)	289 (74.9)	61 (15.8)	23 (6.0)	13 (3.4)
Increase in habits of purchasing/obtaining hand sanitizer	251 (65.0)	82 (21.2)	22 (5.7)	31 (8.0)
Increase in avoidance of contact with people having flu symptoms	244 (63.2)	84 (21.8)	34 (8.8)	24 (6.2)
Decrease in social visits	128 (33.2)	113 (29.3)	68 (17.6)	77 (19.9)
Decrease in handshaking habits	150 (38.9)	81 (21.0)	81 (21.0)	74 (19.2)
Decrease in use of public facilities	173 (44.8)	85 (22.0)	66 (17.1)	62 (16.0)

patients with emerging acute respiratory infectious diseases [11]. We also assessed the knowledge of the participants by asking them certain questions. As is shown in Table 2, between 9.6% and 50.5% of participants agreed on important measures such as wearing face masks in crowded places during influenza season for prevention. A small number of participants (38; 9.8%) did not agree on infection-control measures.

Up to 70%–90% of the participants thought that they had sufficient information about MERS-CoV symptoms, prognosis, treatment, transmission routes, and prevention (Table 3). This finding may indicate that the goals of the campaign were achieved.

The main source of information was college/hospital announcements (86.0%) followed by official statements/press releases from the ministry of health (MOH) and the MOH website (72.1% and 63.2%, respectively). These results reveal the importance of hospital campaigns and the media in the teaching process of HCWs, particularly during outbreaks.

In spite of the severity of infection and the significant number of infections among HCWs, we found that a high percentage of the HCWs (56.7%) did not possess negative perceptions such as feeling nervous, anxious, or on the edge, nor were they unable to stop or control their worrying.

The majority of the participants were in between in terms of emotions; they were somewhat worried (125; 34.2%) and a little worried about contracting MERS-CoV (106; 27.5%). Fewer individuals had been either extremely worried over the past weeks about contracting MERS-CoV (7.8%) or very worried (20.5%).

These findings indicate that worrying was not a major feeling in most of the participants. Most of the participants were between somewhat worried (29%) and a little worried (26.7%) about transmitting MERS-CoV from the hospital to one of their family members or friends, unlike in HCWs in the outbreak of SARS in Toronto that began in 2003. This study described the psychological and occupational impact of this event within a large hospital. Individuals, including 11 HCWs, developed SARS. Staff were adversely affected by fear of contagion and of infecting family, friends, and colleagues [12].

Participants’ perceptions of the benefits of the coronavirus awareness campaign showed responses that ranged between 20% and 26% in terms of understanding MERS-CoV symptoms, transmission, and prevention.

There were no significant differences in the worry scale about the fear of contracting and transmitting MERS-CoV between participants who had direct

**Table 2.** Responses to questions pertaining to infection control practices

Questions pertaining to infection control practices	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
It is important to wear face masks in crowded places during influenza season for prevention	37 (15.4)	113 (46.9)	35 (14.5)	19 (7.8)	37 (15.4)
It is important to maintain good indoor ventilation during flu season to prevent spread of disease	187 (48.5)	136 (35.2)	14 (3.6)	11 (2.9)	38 (9.8)
It is important to avoid going to crowded places during flu season	195 (50.5)	119 (30.8)	24 (6.3)	10 (2.6)	38 (9.8)

**Table 3.** Responses when participants were asked about how sufficient the information is that they have on MERS-CoV symptoms, prognosis, treatment, transmission routes, and prevention

Questions on range of knowledge	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Sufficient information about MERS-CoV symptoms	180 (46.6)	171 (44.3)	12 (3.1)	3 (0.8)	20 (5.2)
Sufficient information about MERS-CoV prognosis	137 (35.5)	191 (49.5)	31 (8.0)	7 (1.8)	20 (5.2)
Sufficient information about MERS-CoV treatment	123 (31.9)	169 (43.8)	42 (10.9)	29 (7.5)	23 (6.0)
Sufficient information about MERS-CoV transmission routes	170 (44.0)	169 (43.8)	16 (4.2)	10 (2.6)	21 (5.4)
Sufficient information about MERS-CoV prevention	170 (44.0)	173 (44.8)	14 (3.6)	8 (2.1)	21 (5.4)

contact with a MERS-CoV patient and those who did not. These findings may indicate that confidence was high after the campaign, and that participants were more restricted and adhered to infection-control precautions.

We discovered a significant difference in the worry and fear scale of contracting the MERS-CoV infection between participants who worked in areas such as isolation areas, ICUs, and emergency rooms (mean:  $3.01 \pm 1.1$ ) and participants who worked in non-isolation areas and areas that were less likely to admit and have MERS-CoV suspected or positive cases (mean:  $2.77 \pm 1.1$ ). The p value of these data was 0.031, and this finding is logical and expected because the exposure of the first group was higher than that of the second group. It was unexpected, however, to find that there was no significant difference in the worry and fear scale of transmitting the infection between participants who worked in isolation areas versus those who worked in non-isolation areas (mean:  $3.12 \pm 1.2$  versus  $2.89 \pm 1.1$ ;  $p = 0.068$ ).

A study examined the degree and the sources of mental distress and the coping strategies adopted by HCWs in emergency departments (ED) in Hong Kong during a SARS outbreak. These results revealed that SARS caused a significant level of distress among ED staff. The distress level was the highest for nurses. The three most important variables that could account for the distress level were loss of control, fear for self-health, and spread of the virus [13].

In our study, most of the participants were nurses and almost all of them were female; females were significantly more worried and fearful of contracting the virus compared with males (mean:  $2.92 \pm 1.1$  versus  $2.61 \pm 1.0$ ;  $p = 0.045$ ). No significant difference in the worry scale in transmitting the virus was found between genders (mean:  $3.02 \pm 1.2$  versus  $2.75 \pm 1.1$ ;  $p = 0.074$ ).

In another study done during the SARS outbreak, there was a significant psychosocial impact on the Toronto hospital staff. In addition, the staff noted an increased awareness of infection control [14].

Similarly, Chan *et al.* found that many HCWs were emotionally affected and traumatized during the SARS outbreak in a medium-sized general hospital in Singapore [15].

## Conclusions

The effects on the families and lifestyles of the healthcare staff were substantial, highlighting the need for greater personal and family support for employees during outbreaks. In addition, educational interventions are necessary to address psychosocial distress. It is

important for healthcare institutions to provide psychosocial support and intervention for their HCWs. The importance of educational campaigns for educating HCWs, the general public, family contacts, and travelers to the Middle East need to be emphasized.

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