

Original Article

Middle East Respiratory Syndrome Coronavirus epidemic impact on healthcare workers' risk perceptions, work and personal lives

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Abstract

Introduction: Middle East respiratory syndrome coronavirus (MERS-CoV) continues to cause frequent outbreaks in hospitals in Saudi Arabia. Since healthcare workers (HCWs) have a higher risk of acquiring and spreading MERS-CoV, we aimed to evaluate the perceived risk and anxiety level of HCWs in Saudi Arabia regarding MERS.

Methodology: An anonymous, self-administered questionnaire was sent online to HCWs at King Khalid University Hospital in Saudi Arabia. The total knowledge and anxiety scores were calculated. Logistic regression analyses were used to identify predictors of high anxiety scores.

Results: Of 591 (70%) HCWs that responded, 284 (55%), 164 (32%), and 68 (13.2%) were physicians, nurses, and technicians, respectively. Physicians obtained a lower median knowledge score (6/9) compared to other professions (7/9). The mean anxiety score was similar for physicians and other HCWs (3/5); however, non-physicians expressed higher levels of anxiety toward the risk of transmitting MERS-CoV to their families, with an anxiety score of 4/5. The ability of the virus to cause severe disease or death was the most frequently reported reason for worry by physicians (89.7%) and non-physicians (87.2%). Overall, 80% of physicians and 90% of non-physicians reported improvement in adherence to hand hygiene and standard precautions while in hospital ($p = 0.002$). Concern over transmitting MERS-CoV to family members was the most predictive factor for anxiety among non-physician HCWs.

Conclusion: A significant proportion of HCWs expressed anxiety about the risk of acquiring MERS-CoV infection. Healthcare institutions need to develop an integrated psychological response for HCWs to the occupational and psychological challenge of MERS-CoV outbreaks.

Key words: Risk perception; attitude; anxiety; healthcare worker; MERS-CoV; Saudi Arabia.

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Introduction

The Middle East respiratory syndrome coronavirus (MERS-CoV) has caused recurrent outbreaks of infectious disease in the Arabian Peninsula since 2012 [1]. As of this study, MERS cases have been reported in 27 countries in or around the Arabian Peninsula, with the majority of cases from Saudi Arabia [2]. Although MERS-CoV has low overall human-to-human transmission potential, there is occasional amplification in the healthcare setting accounting for 38% of all

reported infections [3]. As respiratory droplets are the main mode of transmission of MERS-CoV and because most MERS-CoV occurs in the nosocomial setting, healthcare workers (HCWs) in contact with MERS patients are at high risk of acquiring MERS-CoV infections [4]. HCW-related infections account for 1–27% of the total number of MERS-CoV cases [5]. The epidemic has a mounting impact on HCWs and on the entire healthcare system in Saudi. The principle that HCWs have a duty of care has led to the inviolability of

the patient-doctor relationship and has justified the obligation of HCWs to provide care despite the risks. There are various conflicting ethical and psychological issues relating to HCWs during an epidemic. HCWS’ professional and family responsibilities, staff absenteeism and work force regulations, personal safety, and restriction of personal freedoms during quarantine are commonly the main issues underlying their absenteeism during an epidemic [6]. Although HCWs are essential to the health system response, there are few studies that explored HCWs attitude to an epidemic [7-9]. Therefore, an understanding of HCWs worries, behavior, and knowledge is crucial for appropriate epidemic response. Unlike previous studies, this study was conducted during an ongoing Middle East respiratory syndrome coronavirus (MERS-CoV) outbreak in Riyadh. We aimed to assess the spectrum of concerns and worries among various HCWs at King Saud University Medical City (KSUMC), as well as their perceived sufficiency of information and intended behavior during the current MERS-CoV epidemic in Saudi.

Methodology

This was a cross-sectional survey of the HCWs at King Khalid University Hospital, Riyadh, Saudi Arabia, a tertiary care teaching hospital, with 800 beds capacity. The HCWs are multinational, with majority being from Saudi Arabia, India, Pakistan, and the Philippines. Data were collected in May 2015.

The survey consisted of self-administered, pilot-validated questionnaire, sent to HCWs online. The questionnaire included questions about the demographic characteristics of respondents, including: job category, age, gender, and years of experience and work location. The knowledge section of the survey asked general questions on MERS-CoV modes of transmission, fatality, signs and symptoms, and preventive measures. The responses on the knowledge questions were rated based on the number of correctly answered questions, with a total knowledge score of 9.

These were followed by multiple response questions on HCWs reaction to MERS-CoV epidemic as follows: type of preventive behaviors and practices that changed during the advent of MERS-CoV outbreak (including hand hygiene practices, avoidance behaviors like avoidance of handshaking and direct contact with people suffering from influenza-like illnesses, and use of public facilities) and the effect on annual leave planning. We also compared the response of the physician group to that of other HCW categories.

Using a multiple response format, questions regarding the sources of information that the respondents had access to in order to gain knowledge about MERS-CoV, were asked. Finally, the respondents were asked to rate their “anxiety” level on a 1-5 scale (with higher reported scores denoting higher worry) regarding acquisition of MERS-CoV infection by themselves or of transmitting it to their family, followed by questions to delineate why the HCWs were anxious about contacting MERS-CoV. The items focused on virulence, lack of effective treatment, prognosis, or simply the social media and propaganda that surrounded MERS-CoV infection locally and internationally.

We analyzed the data using SPSS IBM V20 (SPSS, Inc., Chicago, IL, USA). For all tests, statistical significance was set at $p < 0.05$. Summative analysis was used to summarize the scores from continuous Likert’s scale-based questions. Fisher’s exact tests were used to establish the difference between HCW groups (physicians vs. non-physicians) for nominal variables.

To investigate which items predicted the outcome of knowledge, anxiety, and social behavior, logistic regression analyses were performed, adjusted for HCWs gender, years of experience, anxiety toward acquiring MERS-CoV, and social avoidance.

The study was approved by the Institutional Review Board at the College of Medicine and King Khalid University Hospital.

Table 1. Demographic characteristics of participating healthcare workers.

Characteristics	Number (%)
HCWs category	
Physicians total = 284	
Consultant	68 (13.2)
Registrar	48 (9.3)
Resident	71 (13.8)
Intern	97 (18.8)
Non-Physicians. Total = 232	
Nurse	164 (31.8)
Respiratory Therapist	14 (2.7)
Lab technician	34 (6.6)
Radiology technician	20 (3.9)
Work location	
Inpatient wards	173 (19)
ICU	98 (19)
ER	72 (14)
Lab	45 (8.7)
Outpatient Clinics	36 (7)
Radiology Dept.	44 (5.5)
Trainee	25 (4.8)
Total	516 (100)

Results

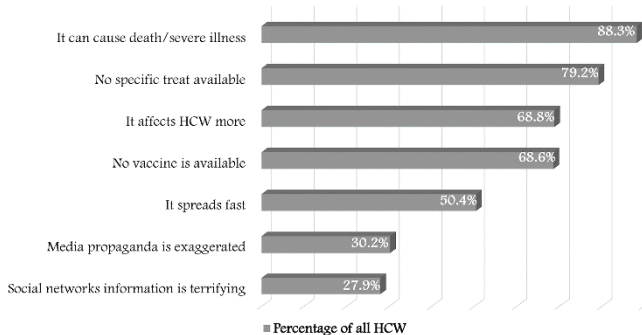
The study questionnaire was electronically mailed to 848 HCWs, and 591 (70%) responded. Seventy-five surveys were excluded because of incomplete answers, resulting in a total of 516 completed surveys in the analysis. The sample consisted of 284 (55%) physicians, 164 (32%) nurses, and 68 (13.2%) technicians and respiratory therapists. All the respondents were involved in direct patients’ care. Table 1 summarizes the respondent characteristics.

There were more females among the non-physician group (78%) compared to the physician group (31%). Only 29 (35%) physicians reported a change in seeking annual influenza vaccine during the recent MERS-CoV outbreak compared to 168 (72%) for other professionals ($p < 0.001$). Physicians obtained a lower median knowledge score (6/9) compared with the score for other professionals (7/9). A substantial number of HCWs reported being worried about contracting MERS-CoV (Figure 1). The mean anxiety score was similar for physicians and other HCWs (3/5). However, non-physicians expressed higher levels of anxiety toward the risk of transmitting MERS-CoV to their families, with an anxiety score of 4/5 compared to 3/5 for the physicians group (Table 2).

For physicians and non-physicians respectively, the most frequently reported reasons for worry were the ability of the virus to cause severe disease or death (89.7% vs. 87.2%) and lack of specific treatment (74% vs. 85.7%) (Table 3). The worry about being more affected through exposure to infected patients was expressed by high numbers of HCWs in both groups (61.6% vs. 73.3%).

Majority of respondents reported significant changes in certain preventive behavioral practices as a result of their worries. Both physicians (80%) and non-physicians (90%) reported improvement in adherence

Figure 1. Reported HCWs reasons of worry about MERS-CoV infection.



to hand hygiene practices and universal precautions while at the hospital ($p = 0.002$). Likewise, self-reported avoidance behavior toward people with influenza-like symptoms was reported by 83% and 70% of non-physician and physicians, respectively. Decreased choice in the use of public facilities, hand shaking, and social visits were reported more frequently in the non-physician group. The comparison of all responses between physicians and non-physicians is presented in Table 2.

All information sources were accessed differently. The two most commonly reported sources on MERS-CoV were hospital announcements and official statements or press release by the Ministry of Health (MOH). More physicians used hospital announcements and the MOH website compared to non-physicians (Figure 2).

The results of the logistic regression analyses showed that non-physicians were more likely to report being worried about contracting MERS-CoV and transmitting it to their family members than physicians (Odds ratio, OR = 3.2). The proportion of non-physicians who reported changes in infection prevention practices were significantly greater

Table 2. Comparison between physicians and non-physicians’ knowledge, anxiety level and change in preventive practices.

Characteristics	Physicians (n = 284)	Other HCW (n = 232)	P-value
Gender: Female no. (%)	89 (31.3%)	180 (77.6%)	< 0.001*
Experience in years, median (IQR)	4 (1-35)	10 (5-39)	< 0.001**
MERS-CoV Knowledge score median (IQR)	6 (5,7)	7 (6,8)	< 0.001
Anxiety Level (1-5) regarding acquiring MERS-CoV median (IQR)	3 (2,3)	3 (3,4)	< 0.001
Anxiety Level (1-5) over family regarding acquiring MERS-CoV	3 (2,4)	4 (3,4)	< 0.001
Improvement in hand hygiene compliance at the hospital	227 (80)	210 (90)	< 0.002
Improvement in compliance with universal precautions at the hospital	194 (69)	198 (85.5)	0.001
Increase in avoidance behavior towards people with flu-like symptoms	202 (72)	193 (83)	< 0.009
Decrease in the choice to use public facilities	81 (28.7)	153 (66)	0.001
Decrease in handshaking	78 (27.7)	139(60)	< 0.001
Decrease in social visits (e.g. visiting friends)	61 (21.7)	138 (60)	< 0.001
Intend to reschedule annual leave	37(13%)	43 (18.5%)	0.055

*Fishers Exact chi square test **Mann-Whitney U test for non-parametric tests; Median (IQR) = median (25th percentile, 75th percentile).

compared to physicians. Differences were also found in the reported sources of information about MERS-CoV.

Discussion

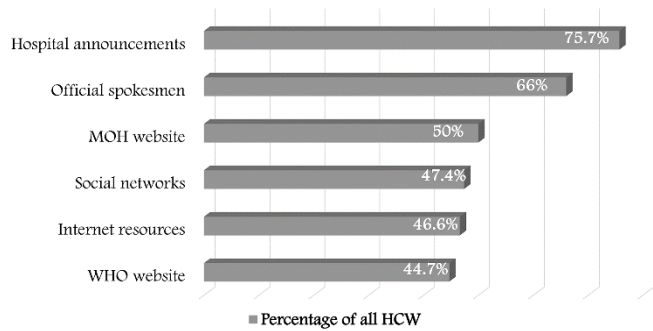
Our study showed that HCWs expressed moderate anxiety toward MERS-CoV infection; the results also showed a clear variability in the degree of anxiety among different categories of HCWs. Surprisingly, a higher level of anxiety toward MERS-CoV infection was prevalent among non-physicians, mainly due to their fears of transmitting the infection to their family members.

HCWs are one of the populations at high-risk for acquiring MERS-CoV infection [10]. Inadequate infection control measures have been reported to be responsible for the nosocomial acquisition of MERS-CoV [11]. Infections occur almost exclusively among staff with close contact with MERS-CoV patients [2,3]. Therefore, an understanding of staff worries and concerns is essential for an appropriate epidemic response.

These reported levels of concerns found in our result are in agreement with the results from similar studies on HCWs at other regions in Saudi Arabia [12,13]. Abolfotouh *et al.* in their study in Riyadh region of Saudi reported an overall HCWs average concern score of 40 out of 93 points, indicating a moderate level of concern [12]. Whereas high level of concerns was reported in 2015 for HCWs at Makkah hospitals, Saudi Arabia [13]. High levels of concern have also been demonstrated in the Saudi public [14]. These negative attitudes and high levels of concern could be attributed to the novelty of MERS-CoV, the lack of previous experience and the possibility that respondents were not thoroughly briefed about the management issues by the relevant authorities during their educational campaign. The concerns of HCWs may affect their overall effectiveness in an outbreak and should be addressed by incorporating management strategies in outbreak planning.

A recent report showed that worry of contracting the MERS-CoV was higher among participants who

Figure 2. Sources of information on MERS-CoV accessed by HCWs.



worked specific patient care areas including isolation wards, ICUs, and emergency room [15]. Another study showed higher degree of anxiety among emergency room resident physicians [16]. Such difference is not surprising since the risk of exposure is not distributed equally. Some specialties, like emergency room and critical care staff, are likely to be at a higher risk than those in unrelated or non-acute specialties.

Although both physicians and other HCWs have significant contact with patients, the non-physician group expressed a higher degree of anxiety, possibly because they regarded themselves as insufficiently informed or that the workplace was not adequately prepared [17]. In the present study the perceived risk and anxiety felt by our HCWs are common in any epidemic. However, the intensity of such perceived risk and anxiety vary. The most frequently reported reasons for worry were that the virus can be transmitted to HCWs from infected patients, its ability to cause severe disease or death, and that there are no specific treatments or vaccines, which is similar to previous reports [18,19].

The significant worry among HCWs of transmitting such severe disease to their own family members during epidemics deserves to be addressed. Beneficial approaches to lessen HCWs concerns during MERS-CoV outbreak may include provision of strict infection control guidelines, equipment, and psychological support. Intensified educational campaigns and

Table 3. Reported HCWs reasons of worry about MERS-CoV infection.

Perceived threat	Physician N (%)	Other HCW N (%)	P-value
It can cause death/sever illness	202 (89.7)	245 (87.2)	0.3843
It affects HCW more	165 (73.3)	173 (61.6)	0.00544
No vaccine is available.	189 (84)	158 (56.2)	< 0.001
No specific Treat. Available.	193 (85.7)	208 (74)	0.001
It spreads fast.	157 (69.7)	98 (34.9)	< 0.001
Media Propaganda is exaggerated.	101 (44.8)	52 (18.5)	< 0.001
Social networks information is terrifying.	94 (41.7)	47 (16.7)	< 0.001

managerial support should be established. Providing counseling and hotline access during outbreak that is dedicated to MERS-CoV infection queries from all HCWs would boost morale and maintain levels of service. Ensuring that adequate protective measures are in place could offer a measure of personal safety reassurance to HCWs. Maintaining the workforce of HCWs during epidemics is crucial, and having healthcare providers feel more safe would improve their commitment to come to work on daily basis, without fearing contracting the disease themselves or their own families.

During SARS outbreak, when asked about the factors that would incentivize staff to continue working during any future epidemics, factors related to safety, disease knowledge, special compensation, and recognition were the dominant motivators. Some of these factors reflect what has been reported in other epidemics [20].

The lower level of concern observed among physicians in our study could be attributed to their greater opportunities for professional development and perhaps more access to professional journals, while others are more likely to obtain information from the mass media [21].

Interestingly, the knowledge score was higher in the non-physician group. Knowledge and years of experience could bring about positive attitudes that can be explained by the theory of reasoned action, which predicts that behavioral intent is caused by both attitudes and subjective norms [22,23]. Kim *et al.* showed that knowledge, and not just trust, had an impact on the perceived risk of MERS [23].

Our finding of lower knowledge score among the physicians is worrisome especially because of the physicians' need to be aware of how they may transmit and acquire MERS-CoV during their clinical activities. This present study finding contradicts the finding of a previously reported study on HCWs knowledge of MERS-CoV in Saudi Arabia [24]. Therefore, our finding suggests the need for targeted educational programs tailored for individual HCW categories.

It is noteworthy that behavioral change varied considerably among HCW categories. In our sample, physicians were significantly less likely to show change in their practices or in their uptake of influenza vaccine compared to other staff.

Less than 30% of physicians reported a decrease in the use of public facilities, handshake, and in social activities compared to more than 60% of other professionals, despite the importance of some cultural issues in Saudi Arabia. Previous study during the

Severe Acute Respiratory Syndrome (SARS) outbreak in 2003 has shown that individual beliefs and perceptions play an important role in subsequent desired behavioral change [25]. Research has shown that the higher the perceived effectiveness of measures undertaken, and the higher the perceived threat of the disease, the higher the rate of positive change. Also, better knowledge increases the uptake of preventive measures [26,27].

The two most commonly reported sources of information on MERS-CoV were hospital announcements and official statements or press release by the MOH. These findings are encouraging since both are official and trusted sources of information. In contrast with the finding of Khan *et al.*, majority of the respondents gained their knowledge about MERS-CoV from the internet [24].

This indicates that each healthcare facility should tailor the educational and awareness campaigns to its unique healthcare providers' needs and communication channels.

There are few limitations to this study that warrant a discussion. Due to the use of a self-administered electronic questionnaire, the self-reported information on which the analysis was based may not be entirely correct due to the possibility of recall bias. In addition, the voluntary nature of the survey may have created a selection bias of the study sample. In this study, HCWs could have provided a more positive picture toward the practice of standard precautions than they would have revealed by other data collection methods. This was also a single-center experience; thus, the generalization of the result would be limited by time that had elapsed since the most stressful period of the peak of the outbreak.

Despite these limitations, this study addressed an important concern that faces HCWs in Saudi Arabia. This study differed from previous studies because it was conducted during an ongoing MERS-CoV outbreak in Riyadh, when many HCWs reported their experience of caring for MERS patients. Therefore, we believe that the result of our study was more likely representative of the actual response of HCWs.

Conclusion

HCWs in different categories perceived a risk of exposure to MERS-CoV at work.

HCWs, including non-physicians, should be provided with appropriate targeted education. The psychological needs and concerns of HCWs should be addressed. Healthcare institutions have a duty to help

their staff cope with anxiety and stress in the workplace during MERS-CoV outbreaks.

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Authors' contributions

SA and MT contributed equally. SA, MT, AAA designed the study and prepared the survey. MT coordinated and monitored the study activities. SA, MT and IG interpreted the results. SA drafted and edited the manuscript. MT, AMS edited and critically revised the manuscript. AA, AJ, GH, FA and ANA revised the manuscript. All authors read and approved the final manuscript.

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