CORRESPONDENCE

Middle East Respiratory Syndrome Coronavirus Infections in Health Care Workers

TO THE EDITOR: A majority of the 94 cases of Middle East respiratory syndrome coronavirus (MERS-CoV) infection that have been reported to date have occurred in Saudi Arabia. Patients with this infection have presented with serious respiratory disease and have required hospitalization.[1,2] However, there have been case reports of less severe disease within family[3,4] and hospital[2] clusters, and the clinical spectrum of MERS-CoV infections may extend to asymptomatic and subclinical cases. Therefore, the epidemiologic and clinical characteristics of this infection need further definition. The patterns of the spread of MERs-CoV among family[3,4] or hospital[2] clusters suggest that transmission occurs through droplets or contact. We previously reported two cases of MERS-CoV infection in health care workers,[2] one of which was fatal.

The presence of asymptomatic or subclinical MERS-CoV infections in the community or among health care workers could have important public health implications, since these infections may be sources of transmission to close contacts in the community or to patients with coexisting medical conditions. The close proximity of health care workers to patients and the handling of human biologic material (sputum, respiratory secretions, feces, urine, or blood) may increase the risk of transmission, and health care workers may be particularly at risk for MERS-CoV infections.

The Saudi Arabian Ministry of Health routinely screens all close contacts of patients in whom MERS-CoV infection has been diagnosed, and more than 3000 people have been screened to date. We recently identified seven health care workers with MERS-CoV infection (two of whom were asymptomatic and five of whom had mild upper respiratory tract symptoms) through screening of single sample nasopharyngeal swabs by means of a real-time reverse-transcriptase–polymerase-chain-reaction (RT-PCR) amplification test, with amplification targeting both the upstream E protein gene (*upE*) and open reading frame 1a (*ORF1a*) for confirmation. A patient was confirmed as having MERS-CoV infection if both assays were positive. Table 1 outlines the clinical characteristics of these seven health care workers, and Table S1 in the Supplementary Appendix, available with the full text of this letter at NEJM.org, summarizes their level of contact with patients and the infection-control procedures undertaken. Some of the nurses did not follow infection-control procedures fully and therefore had maximal exposure. All the infected nurses were women, and all had previously been healthy except for one who had diabetes. Two had asymptomatic cases of MERS-CoV infection, one had only a runny nose, and four reported mild symptoms. They did not require treatment, recovered fully within a week, and remained healthy on follow-up. On daily follow-up PCR testing, six of seven tested positive for MERS-CoV on day 2 and negative on day 3; one remained positive until day 8. There was no history of exposure to animals or to persons with MERS-CoV infection in the community, and no subsequent cases of MERS-CoV were associated with these seven health care workers.

A family cluster of MERS-CoV was identified in the United Kingdom in early 2013.[4] Screening of 59 health care workers who were in contact with the index patient without observing infection-control procedures did not reveal any MERS-CoV infections. The identification of asymptomatic and subclinical cases of MERS-

Table 1. Characteristics of Health Care Workers with Confirmed MERS-CoV Infection.*

Characteristic	Health Care Worker						
	1	2	3	4	5	6	7
Age (yr)	42	29	46	39	59	28	56
Sex	Female	Female	Female	Female	Female	Female	Female
Result of chest radiography	Normal	Normal	Normal	Normal	Normal	Normal	Normal
MERS-CoV PCR test	Positive	Positive	Positive	Positive	Positive	Positive	Positive
Viral load (Ct value)	33	37	38	34	35	30	37
Coexisting condition							
Diabetes mellitus	Yes	No	No	No	No	No	No
Other	No	No	No	No	No	No	No
Symptoms							
Feverish feeling	Yes	No	Yes	No	No	Yes	Yes
Fever, measured	Yes	No	No	No	No	No	No
Cough	Yes	No	No	No	No	No	Yes
Sore throat	Yes	No	Yes	No	No	Yes	Yes
Runny nose	No	No	Yes	No	Yes	Yes	Yes
Muscle aches	Yes	No	Yes	No	No	No	Yes
History of exposure	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* For more details, see the table in the Supplementary Appendix, available with the full text of this letter at NEJM.org. Ct denotes cycle threshold, MERS-CoV Middle East respiratory syndrome coronavirus, and PCR polymerase chain reaction.

CoV infection in health care workers brings to light the urgent need to develop a rapid, sensitive, and specific diagnostic test and to conduct studies to accurately define the clinical spectrum of MERS-CoV infection. Maintaining a high awareness of the possibility of MERS-CoV infection and rapidly initiating infection-control measures are important strategies for controlling nosocomial transmission.[2] Health care workers should be reminded of the importance of systematic implementation of infection-prevention and infection-control measures.[5] Several questions remain about the possible infectiousness of body fluids, excreta, and clinical samples and their infectivity and cross-transmission through contaminated surfaces and medical devices to the hands of health care workers. Hospitals that provide care for patients with suspected or confirmed MERS-CoV infection should take appropriate measures[1-5] to decrease the risk of transmission of the virus to other patients, health care workers, and visitors.

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3. Memish ZA, Zumla AI, Al-Hakeem RF, Al-Rabeeah AA, Stephens GM. Family cluster of Middle East respiratory syndrome coronavirus infections. N Engl J Med 2013;368:2487-94.
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