

**Title:** Surveillance and public health response for travelers returning from MERS-CoV affected countries to Gyeonggi Province, Korea, 2016-2017

**Running Title:** Surveillance of MERS-CoV in Korea

**Authors:** Sukhyun Ryu <sup>a,b</sup>, Joon Jai Kim <sup>a</sup>, Benjamin J. Cowling<sup>b</sup>, Chulhee Kim <sup>a</sup>

**Affiliations:**

<sup>a</sup>Division of Infectious Disease Control, Gyeonggi Provincial Government, Suwon; <sup>b</sup>WHO Collaborating Centre for Infectious Disease Epidemiology and Control, School of Public Health, Li Ka Shing Faculty of Medicine, The University of Hong Kong, Hong Kong

**Corresponding author:** Sukhyun Ryu

WHO Collaborating Centre for Infectious Disease Epidemiology and Control, School of Public Health, Li Ka Shing Faculty of Medicine, The University of Hong Kong, Hong Kong

Tel: +82-31-8008-5428, Fax: +82-31-8008-4179

E-mail: gentryu@onehealth.or.kr

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*Dear Editor,*

Previous surveillance study for Middle East Respiratory Syndrome Coronavirus (MERS-CoV) conducted at Saudi Arabia in 2015 and 2016 showed that influenza vaccination in returning travelers from MERS-CoV affected countries are needed, because other respiratory virus infection including influenza are much more common [1]. Here, we describe the consistent finding of previous study [1] from the surveillance of the population of Gyeonggi province where is the most populous province in Korea (with population of 25.5 million and size of 11,730 km<sup>2</sup>) in 2016 and 2017. Furthermore, we demonstrate Korean public health effort to prevent local transmission of MERS-CoV. In 2015, the Republic of Korea experienced a large outbreak of MERS-CoV with 186 laboratory confirmed cases [2]. In this outbreak, inter-hospital and intra-hospital transmission was a determination factor for MERS-CoV infection [2]. Following the aftermath of this outbreak, a Korean national surveillance program with virologic testing including other respiratory viruses was implemented to rapidly identify further importations of MERS-CoV infection from the returning travelers from MERS-CoV affected countries.

Suspected cases of MERS-CoV infection were defined as persons with a lower respiratory tract illness (cough, sputum or shortness of breath) with fever (over 37.8°C), having an epidemiological link to travelling MERS-CoV affected countries within the preceding 14 days [3]. Demographic and clinical information on suspected cases was collected through interview [3].

Suspected cases were immediately transferred by ambulance to a negative pressure room in an isolation ward of a designated hospital by public health officers equipped with personal protective equipment including disposable coveralls, nitrile gloves, N95 particulate half-mask with two-strap design, unvented goggles and boots. Upper and lower respiratory specimens

(nasopharyngeal, oropharyngeal swab and sputum) and blood samples of individuals with suspected infection were collected and transported to the provincial public health laboratory immediately at 4°C [3]. The delay between their onset of symptom reported and notification toward public health authority, and the time of the quarantine including self-isolation was recorded.

Qualitative Real-time Reverse Transcription-Polymerase Chain Reaction (rRT-PCR) testing were conducted to identify MERS-CoV by using TaqMan method targeting regions upstream of the envelope (UpE) and the open reading frame 1a gene [4]. The Cycle of Threshold value  $\leq 37$  was regarded as positive [4]. Furthermore, to identify other respiratory viruses including influenza (IFV; A, B), human respiratory syncytial virus (hRSV; A, B), human metapneumovirus (hMPV; A, B), human parainfluenzavirus (hPIV; I, II, III), human adenovirus (hAdV), human bocavirus (hBoC), human rhinovirus (hRV), and human coronavirus (hCoV; 229E, OC43, NL63), additional rRT-PCR has been conducted using respiratory swabs.

Table 1 shows the characteristics of suspected cases. The median age of the suspected cases was 43 years (range 1 to 70; mean, 42.3); 56 were male. 7 had underlying disease (hypertension and/or diabetes). The suspected patients had a median of 11 contacts (range, 1 to 33; mean, 21.2). The median delay between the onset of symptoms and the notification was 30 hours (range, 0 to 240 hrs; mean 21 hrs). The median time interval between notification and quarantine of case was 1.0 hour (range, 0 to 63 hrs; mean, 3.4 hrs). The median time interval between the onset of symptom and quarantine was 35 hours (range, 2 to 240 hrs; mean, 53 hrs).

All the specimens were confirmed as MERS-CoV negative. However, a viral etiology was detected in 66 (66%) of cases; Influenza A H3N2 (23 suspected patients, 23%), hRSV (12,

12%), Influenza B (11, 11%), Influenza A H1N1 (10, 10%), hMPV (7, 7%), hCoV (5, 5%), hAdV (3, 3%), hPIV II (1, 1%), and hBoC (1, 1%) were identified.

During the surveillance for the travelers with respiratory illness, MERS-CoV was not identified by laboratory testing. The delay between initiation of symptom and the quarantine was relatively fast compare to the United Kingdom (Median interval: 5 days, range: 1 to 2 days) [5]. The detection rate of other respiratory virus pathogen was 66.3% which is higher than surveillance report in the United Kingdom (50.3%) [5]. Thus, influenza vaccination prior to travel may help travelers themselves and saving the public health resources [1].

A significant fraction of MERS-CoV confirmed cases in previous outbreaks have been linked with the healthcare setting (99%; Republic of Korea in 2015, 43%; Jeddah in Saudi Arabia in 2014) [2, 6]. Therefore, the continuous and immediate public health response after initiation of symptom onset of the suspected case prior to visit the health care facilities is important.

This study has several limitations. Since MERS-CoV infection has a wide spectrum of illness from asymptomatic to severe, some potential cases could have been missed. However, there was no additional case reported from the hospitals in Gyeonggi Province through the surveillance network of Severe Acute Respiratory Infection.

In this study, MERS-CoV infection was not identified in Gyeonggi Province, Korea. However, surveillance with rapid public health response of returning travelers from MERS-CoV affected countries should be continued to reduce the risk of importation of MERS-CoV.

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**Table 1.** Characteristics of suspected cases of Middle East respiratory virus (MERS) (n=99).

	Number (%)
Sex	
Male	56 (56.6)
Female	43 (43.4)
Age groups, years	
0-18	9 (9.1)
19-65	77 (77.8)
>65	13 (13.1)
Nationality	
Korean	94 (94.9)
Saudi Arabian	2 (2.0)
UAE	2 (2.0)
Pakistani	1 (1.0)
Interval of public health response <sup>†</sup>	
< 1 hours	62 (62.6)
1 — < 2 hours	11 (11.1)
2 — < 3 hours	7 (7.0)
3 — < 4 hours	4 (4.0)
> 5 hours	15 (15.2)
Risky behavior on the trip	
Contact with dromedaries	2 (2.0)
Visited health care facility	3 (3.0)

<sup>†</sup> The interval between notification to public health authority and quarantine of suspected case