

# Transmissibility of MERS-CoV Infection in Closed Setting, Riyadh, Saudi Arabia, 2015

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To investigate a cluster of Middle East respiratory syndrome (MERS) cases in a women-only dormitory in Riyadh, Saudi Arabia, in October 2015, we collected epidemiologic information, nasopharyngeal/oropharyngeal swab samples, and blood samples from 828 residents during November 2015 and December 2015–January 2016. We found confirmed infection for 19 (8 by reverse transcription PCR and 11 by serologic testing). Infection attack rates varied (2.7%–32.3%) by dormitory building. No deaths occurred. Independent risk factors for infection were direct contact with a confirmed case-patient and sharing a room with a confirmed case-patient; a protective factor was having an air conditioner in the bedroom. For 9 women from whom a second serum sample was collected, antibodies remained detectable at titers  $\geq 1:20$  by pseudoparticle neutralization tests ( $n = 8$ ) and 90% plaque-reduction neutralization tests ( $n = 2$ ). In closed high-contact settings, MERS coronavirus was highly infectious and pathogenicity was relatively low.

Middle East respiratory syndrome (MERS) coronavirus (CoV) is a zoonotic virus (1). Approximately 2,266 laboratory-confirmed cases of MERS have been reported to the World Health Organization (WHO) (2) since the identification of the first human cases in 2012 (3,4).

Although the primary source of human infections is MERS-CoV-infected dromedaries, the modes of transmission from dromedaries to humans remain unclear (5). Human-to-human transmission has occurred primarily in healthcare settings (6), sometimes resulting in large explosive outbreaks (7,8). However, to date, no sustained human-to-human infection has been detected. Few outbreaks of MERS-CoV outside of healthcare settings have been documented, and

limited transmission within families has been reported, but secondary attack rates in households or in settings outside of healthcare facilities (e.g., farms) seem to be low (9).

The nonspecificity of clinical definitions for MERS-CoV and the tendency of surveillance to focus on severe cases suggest that the prevalence of mild or asymptomatic infection cannot be estimated from case-based clinical surveillance alone (10). Mild or asymptomatic cases have been identified from contact tracing of laboratory-confirmed case-patients in several countries, including Saudi Arabia, the United Arab Emirates, Qatar, and South Korea (11–16).

In early October 2015, a cluster of MERS-CoV infections was identified among expatriate women working for a women-only university in Riyadh, Saudi Arabia. At the time the outbreak investigation was initiated, Kingdom of Saudi Arabia (KSA) Ministry of Health officials had identified 8 MERS case-patients by reverse transcription PCR (RT-PCR) (17); all patients were epidemiologically linked through their place of residence, a dormitory that housed expatriate women. Two additional laboratory-confirmed cases were identified among healthcare workers who had been exposed to the first case-patient, who had sought treatment at a medical clinic near the residence (17).

As part of this outbreak investigation, we conducted a molecular and seroepidemiologic study of the residents of an expatriate dormitory where the initial case-patients lived. Our goal was to describe and characterize the outbreak, determine potential source(s) of the outbreak, estimate the extent of MERS-CoV infection among residents, and evaluate risk factors for infection among residents.

## Methods

### Selection and Recruitment of Study Participants

We used the MERS-CoV standardized serologic investigation protocol developed by WHO and the Consortium for the Standardization of Influenza Seroepidemiology (18)

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DOI: <https://doi.org/10.3201/eid2510.190130>

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and adapted it to the context of this outbreak. All 828 residents of the women-only expatriate dormitory in Riyadh were informed of the purpose of the outbreak investigation by KSA Ministry of Health official field teams and asked in person to participate. The KSA Ministry of Health, WHO, and Institut Pasteur field teams provided information sessions about the study and about MERS-CoV. The response team established a nursing station within the residential compound and assigned 2 nurses to reside within the compound to follow up with exposed persons and keep a log of any medical complaints from the residents throughout the outbreak period. Because this outbreak investigation was part of a public health response, it was not considered by the KSA Ministry of Health, Institut Pasteur, or The University of Hong Kong to be research that was subject to review by an institutional review board. As such, written informed consent was not required.

Included in the investigation were all residents of the dormitory who orally provided consent for completion of a questionnaire; collection of a nasopharyngeal or oropharyngeal swab sample, or both; and collection of a blood sample for serologic testing. Exclusion criteria included being <16 years of age at the time of recruitment, having any contraindication to venipuncture, or both.

The interviewers were trained to use the data collection forms developed for this investigation; because most residents were from the Philippines, the questionnaire was translated into Tagalog (Appendix, <https://wwwnc.cdc.gov/EID/article/25/10/19-0130-App1.pdf>). Each question was read aloud to women in groups of 15–25 in the dormitory while they filled in the questionnaire by hand. A subset of more sensitive questions was administered one-on-one by a member of the investigation team over the course of the 3-day field investigation. Before study implementation, frontline staff, including all outbreak investigation personnel, were trained with regard to infection control procedures, including proper hand hygiene and the correct use of respiratory face masks, to minimize their own risk for infection when in close contact with patients during home visits and elsewhere and to minimize the potential risk for MERS-CoV transmission between participants or between households.

### Specimen Collection and Testing for MERS-CoV

Any participant who reported respiratory symptoms during the initial investigation (October 19–28, 2015) or during a 14-day follow-up period (after last contact with a confirmed/suspected MERS-CoV patient) was immediately isolated, and nasopharyngeal/oropharyngeal swab samples were collected and tested for MERS-CoV by RT-PCR. RT-PCR testing of human biological specimens was conducted at the Riyadh Regional Laboratory by use of standardized RT-PCR methods for MERS-CoV testing (19). Any participants with a positive MERS-CoV result by RT-PCR

according to WHO criteria (10) were reported to WHO under the requirements of the International Health Regulations (2005) (<https://www.who.int/ihr/9789241596664/en>).

On November 1–2, 2015, a total of 5 mL of blood was collected from consenting residents of the compound. The blood was collected in a serum collection tube according to standard procedures and labeled with a coded identification number linked to the data collection forms. Transport of specimens within national borders complied with the applicable national regulations of Saudi Arabia. International transport of MERS-CoV specimens followed applicable international regulations (20).

Serologic assays used to detect and confirm seropositivity in the serum samples were MERS-CoV S1 IgG ELISA (EUROIMMUN EI 2604–9601G kit, <https://www.euroimmun.com>), MERS-CoV spike pseudoparticle neutralization test (ppNT), and 90% plaque-reduction neutralization test (PRNT<sub>90</sub>). Serologic testing for MERS-CoV antibodies was conducted at the University of Hong Kong, as previously described (21). All serum samples were screened by MERS-CoV S1 ELISA, and positive or equivocal samples were further tested by ppNT and PRNT<sub>90</sub>. Serologic results were interpreted as positive if PRNT<sub>90</sub> or ppNT titer for either the first or second serum specimen was  $\geq 1:20$ .

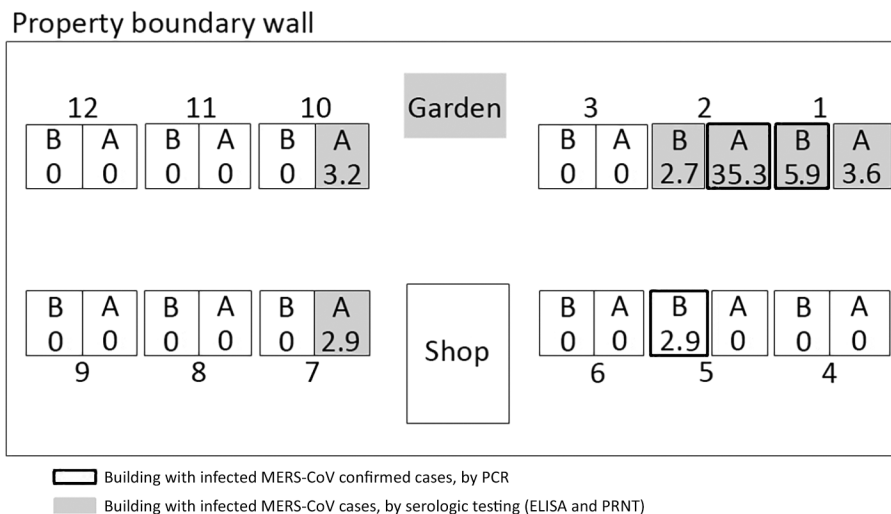
### Statistical Analyses

We entered all data for analysis in the entry form in Epi Info 3.5.4 (<https://www.cdc.gov/epiinfo>) and exported it to statistical software Stata 14 (<https://www.stata.com>). We estimated risk factors for infection among case-patients and non-case-patients (risk ratios [RRs] and 95% CIs) and within a nested case-control study (odds ratios [ORs] and 95% CIs) by restricting analyses to residents living in villas in which laboratory-confirmed cases had been identified.

### Results

The first patient in this cluster who had laboratory-confirmed MERS was a 27-year-old woman who worked as a janitor in a women-only university in Riyadh. She reported experiencing dry cough and fatigue on October 1, 2015; she sought care at a private healthcare clinic on October 4 and was provided treatment and sent home the same day. On October 7, after signs and symptoms worsened to include fever, shortness of breath, productive cough, and signs of pneumonia, she again sought care in the same healthcare clinic, and a diagnosis of MERS was suspected. On October 8, a nasopharyngeal sample was collected and the patient was transferred to a public hospital in Riyadh, designated for isolation and treatment of MERS patients. MERS-CoV infection was confirmed on October 9. A second case in this cluster has recently been described (22).

The first patient resided in an enclosed, women-only, expatriate dormitory composed of 24 villas (Figure 1). Each



**Figure 1.** Schematic of expatriate dormitory (the residence, buildings 1–12) and MERS-CoV infection attack rates (IARs), Riyadh, Saudi Arabia, 2015. Each building contained 2 villas on 3 floors. The distance between buildings is ≈5 m. During the initial investigation (October 2015), 8 residents were positive for MERS-CoV by PCR (indicated by black boxes); they lived in buildings 1B, 2A, and 5B. A vegetable garden separated buildings 3 and 10, and a convenience store (shop) separated buildings 6 and 7. IARs are shown as percentages inside each villa. MERS-CoV, Middle East respiratory syndrome coronavirus; PRNT, plaque-reduction neutralization test.

villa is a 3-story building with 7 bedrooms (2 on the ground floor, 3 on the first floor, and 2 on the second floor) and is inhabited by 24–50 women. On inspection of the living quarters, the field team found that most of the windows in the bedrooms were closed and sealed and that ventilation within the bedrooms was poor. Initial open-ended interviews with some residents informed the study team that residents shared the same kitchen and dining room within the villa but did not typically eat together or share food at mealtimes. There were no designated social spaces; however, residents reported gathering around laptops to watch movies together.

A total of 828 women who lived in the residence complex were included in the seroepidemiologic study; none of the eligible women refused to participate. All participants were female, and median age was 35.1 (26.6–41.3) years. None were Saudi Arabia nationals; they were from the Philippines (84.6%), Sri Lanka (6.4%), Indonesia (2.9%), Nepal (1.6%), and India (1.1%) (Table 1). A total of 49 participants (1 case-patient and 48 non-case-patients) reported having ≥1 chronic condition (e.g., asthma, diabetes, heart disease, hypertension, breast cancer) (Table 1). The MERS case-patient reported having asthma; among non-case-patients, the most common chronic conditions reported were asthma (31%), diabetes (25%), and hypertension (18%).

In terms of occupation, almost half (49.1%) of participants reported working at the women-only university in Riyadh, including 17 (89.5%) of the MERS case-patients (Table 1). Participants reported working in 1 of 4 hospitals as either their primary or secondary occupation (Table 1).

Contact tracing of the initial patient and molecular and serologic laboratory test results identified an additional 18 MERS-CoV infections (Figure 2; Table 2). Of the 19 total case-patients, 12 (63.2%) were from villa 2A; 2 (10.5%) were from a facing villa (1B); and 1 case (5.3%) was reported from each of 5 villas either close to the mostly

affected villa (2A) or 2 other villas (10A and 7A) populated with residents from the Philippines (Figure 1).

Among the 8 MERS-CoV cases positive by PCR, 8 were also serologically positive for MERS-CoV (Table 2). According to PRNT<sub>90</sub> or ppNT serology results for either the first or second serum sample, an additional 11 persons were serologically positive for MERS-CoV infections. Therefore, a total of 19 of the 828 dormitory residents had evidence of MERS-CoV infection by molecular or serologic testing or both; the infection attack rate [IAR] for the cohort was 2.3%.

Of the 9 patients from whom a second sample was collected in March 2016, a total of 8 had ppNT titers of ≥1:20, and only 2 of these had PRNT<sub>90</sub> titers of ≥1:20. For 2 of these 8 patients, ppNT indicated a ≥4-fold fall in antibody titer; for the others, ppNT antibody levels remained within 2-fold that of the initial serum sample.

Bivariate analyses indicated significant associations between MERS and the following risk factors: having direct contact with a known MERS patient (RR 10.9, 95% CI 6.7–17.6); sharing a bedroom (RR 25.5, 95% CI 10.3–63.1), kitchen (RR 15.5, 95% CI 5.4–44.2), bathroom (RR 25.5, 95% CI 10.3–63.1), meal (RR 19.4, 95% CI 7.5–50.3), or transportation vehicle (RR 11.8, 95% CI 4.9–28.5); and having indirect contact with a known patient (RR 15.5, 95% CI 5.4–44.2) (Table 3). The presence of a chronic condition did not vary by MERS infection status. According to multivariate analyses, direct contact with a known MERS patient (OR 27.6, 95% CI 8.4–91.0) and sharing a bedroom with a MERS patient (OR 5.7, 95% CI 1.5–22.5) remained statistically significant. Having a functioning air conditioner in the bedroom was protective (OR 0.15, 95% CI 0.03–0.82). None of the women reported traveling outside of Saudi Arabia in the 14 days before symptom onset (data not shown).

**Table 1.** Demographic characteristics of participants with and without MERS-CoV infection in study of MERS-CoV transmissibility in a closed setting, Riyadh, Saudi Arabia, 2015\*

Characteristics	All participants, no. (%), n = 828	Case-patients, no. (%), n = 19†	Non-case-patients, no. (%), n = 809
Sex			
F	814/814 (100)‡	19/19 (100)‡	795/795 (100)‡
M	0	0	0
Nationality	779	19	760
Filipino	659 (84.6)	19 (100)	640 (84.2)
Sri Lankan	50 (6.4)	0	50 (6.6)
Nepali	12 (1.5)	0	12 (1.6)
Bangladeshi	28 (3.6)	0	28 (3.7)
Indonesian	22 (2.8)	0	22 (2.9)
Indian	8 (1.0)	0	8 (1.0)
Highest level of education reached	779	19	761
Primary school	80 (10.3)	1 (5.3)	79 (10.4)
High school	377 (48.4)	10 (52.6)	368 (48.4)
University/diploma	234 (30.0)	4 (21.1)	230 (30.3)
Postgraduate degree	77 (9.9)	4 (21.1)	73 (9.6)
No education	11 (1.4)	0	11 (1.4)
Primary occupation	770	19	751
Women-only university	378 (49.1)	17 (89.5)	361 (48.1)
Public university	12 (1.6)	0	12 (1.6)
Hospital A	32 (4.2)	0	32 (4.3)
Hospital B	238 (30.9)	2 (10.5)	236 (31.4)
Hospital C	54 (7.0)	0	54 (7.2)
Hospital D	56 (7.3)	0	56 (7.5)
Secondary occupation	83/805 (10.3)	3 (15.8)	80 (10.7)
Hospital A	NA	2 (10.5)	17 (2.3)
Hospital D	NA	1 (5.3)	10 (1.3)
Other (health club)	NA	0	53 (7.0)
Any underlying medical conditions	49/780 (6.3)	1 (5.0)	48/761 (6.3)
Regularly smoke (% daily)	10/773 (1.3)	1/19 (5.6)	9/755 (1.2)
Current chronic conditions§	49/780 (6.3)	1/19 (5.3)	48/761 (6.3)

\*Median age (interquartile range): for all, 35.1 (26.6–41.3) years; for case-patients, 29.8 (28–37.2) years; for non-case-patients, 35.2 (29.6–41.4) years. CoV, coronavirus; MERS, Middle East respiratory syndrome; NA, not applicable.

†Molecular or serologic evidence of MERS-CoV infection.

‡Denominator indicates the number of women who answered the question.

§Included asthma, diabetes, heart disease, hypertension, and breast cancer.

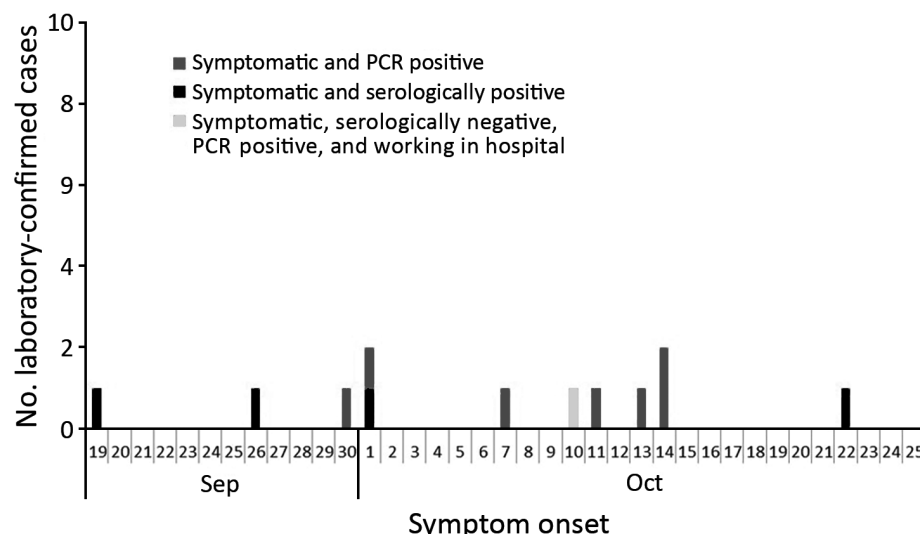
## Discussion

This study details the comprehensive investigation of a cluster of MERS cases reported outside a healthcare-associated or camel industry-associated occupational setting. In this women-only, expatriate worker dormitory in Riyadh, Saudi Arabia, the overall IAR of 2.3% is similar to that found in a household contact study conducted in 2014 (IAR of 4.3%) (9). However, in this outbreak, the residential setting was more crowded than typical single-family households. Although we found the IAR in some villas to be low, we identified IARs as high as 35.3% (12/34) in 1 villa (2A), probably because of the exceptionally crowded living and sleeping conditions. Within this villa, 12 women were infected with MERS-CoV but only 10 reported any symptoms. Rates of IAR were not affected by the presence or absence of underlying conditions or the median age of residents by villa.

This study identified the independent risk factors for infection to be direct contact and sharing a bedroom with a MERS patient. Findings from other serologic studies have been similar (23). We hypothesize that the increased human-to-human transmission within villas resulted from

the clustering of the women's activities. For example, the same women who lived together typically ate and socialized together, worked together, and traveled to and from work together. These activities added to the likelihood of intense direct physical contact among the women and probably led to limited but effective human-to-human transmission within their residence.

Globally, the extent of human-to-human transmission outside of healthcare facilities is uncertain, and whether MERS-CoV has the potential for sustained community transmission is unclear. Transmission among family members seems to be limited but can be amplified in healthcare settings (24,25) among persons with underlying medical conditions and to healthcare workers. Contributors to propagation of MERS-CoV infection in healthcare facilities include aerosol-generating procedures such as intubation, suction, and collection of nasopharyngeal swabs (26). Compared with the total number of MERS-CoV infections reported to WHO to date, patients in our study cohort were significantly younger (median age 32 vs. 52 years, respectively), healthier (6.3% vs. 41.0% reporting  $\geq 1$  chronic condition), and more likely to be female (0 vs. 68.1% male) (27).



**Figure 2.** Epidemiologic curve for symptomatic laboratory-confirmed case-patients with Middle East respiratory syndrome coronavirus infection, Riyadh, Saudi Arabia, 2015. The curve includes only the 12 case-patients for whom symptom onset was reported, not the 7 case-patients for whom infection was serologically confirmed but no symptoms were reported in the preceding 4 weeks.

Healthcare staff can prevent human-to-human transmission of MERS-CoV through stringent adherence and implementation of detailed and clear protocols for standard, droplet, and aerosol infection prevention and control (IPC) measures among the various persons within a healthcare setting (i.e., healthcare workers, patients, and visitors) (28). Such IPC measures were not followed by the inhabitants of the dormitory in this study.

Although we were able to rule out a connection to dromedary camels, we were not able to specifically determine the

source of this outbreak. Of the 19 laboratory-confirmed case-patients, 17 reported working at the same women-only university in Riyadh and the other 2 worked primarily as cleaners at the same healthcare facility in Riyadh (hospital B). Of these 19 case-patients, 3 also reported having a secondary place of employment, including working as cleaners at 2 other hospitals in Riyadh (hospitals A and D). We hypothesize that 1 of the 19 infected women identified in this investigation may have been exposed to and infected with MERS-CoV while working as a cleaner in a healthcare facility

**Table 2.** Characteristics of MERS-CoV–positive participants identified from molecular and serologic assay results in study of MERS-CoV transmissibility in a closed setting, Riyadh, Saudi Arabia, 2015\*

Age, y	Bldg no.	Signs/symptoms†	Symptom onset date	RT-PCR‡	Serologic test						Serologic test result§
					SI ELISA		ppNT		PRNT <sub>90</sub>		
					First sample	Second sample	First sample	Second sample	First sample	Second sample	
23	1B	Yes	Oct 11	+	1.586	0.523	80	20	20	10	+
28	5B	Yes	Oct 14	+	2.225	NA	80	NA	40	NA	+
29	2A	Yes	Oct 13	+	1.181	NA	20	NA	10	NA	+
29	2A	Yes	Oct 14	+	4.57	NA	160	NA	80	NA	+
28	2A	Yes	Oct 1	+	3.154	2.741	160	160	40	40	+
26	2A	Yes	Oct 7	+	3.154	NA	160	NA	40	NA	+
39	2A	Yes	Sep 30	+	1.553	NA	40	NA	20	NA	+
53	2A	No	NS	+	4.242	NA	160	NA	80	NA	+
41	1B	No	NS	NA	1.311	0.33	20	10	10	<10	+
37	2A	Yes	Oct 10	–	1.214	0.569	40	20	10	<10	+
30	2A	Yes	Oct 22	–	0.759	0.605	20	20	0	<10	+
24	2A	Yes	Oct 1	–	1.422	NA	80	NA	20	NA	+
32	2A	Yes	Sep 26	–	3.381	1.012	80	20	20	10	+
28	2A	Yes	Sep 19	–	1.999	1.654	40	40	10	20	+
30	1A	No	NS	NA	3.295	1.496	40	20	10	<10	+
36	2B	No	NS	–	1.419	NA	20	NA	20	NA	+
42	7A	No	NS	NA	0.576	NA	10	NA	20	NA	+
37	10A	No	NS	NA	1.115	NA	80	NA	80	NA	+
45	2A	No	NS	–	1.111	0.563	20	20	<10	<10	+

\*First samples collected November 13, 2015; second samples collected March 22, 2015. Bldg, building; CoV, coronavirus; MERS, Middle East respiratory syndrome; NA, not available/not collected; NS, no signs/symptoms reported; ppNT, pseudoparticle neutralization test; PRNT<sub>90</sub>, 90% plaque-reduction neutralization test; RT-PCR, reverse transcription PCR; +, positive; –, negative.

†Self-reported or observed signs/symptoms in the 14 d before epidemiologic interview.

‡According to World Health Organization criteria ([http://www.who.int/csr/disease/coronavirus\\_infections/mers-laboratory-testing](http://www.who.int/csr/disease/coronavirus_infections/mers-laboratory-testing)).

§Serologic test result was defined as positive if either PRNT<sub>90</sub> or ppNT titers were ≥20. SI ELISA results are shown for information only; they were not used in designating infection status.

**Table 3.** Bivariate analyses of reported exposures to known MERS patient, including overall cohort, in study of MERS-CoV transmissibility in a closed setting Riyadh, Saudi Arabia, 2015\*

Reported exposure	Case-patients, no. (%), n = 19	Non-case-patients, no. (%), n = 809	p value†	RR (95% CI)
Direct contact with known (symptomatic) MERS-CoV case-patient	11 (57.9)	43 (5.3)	<0.001	10.9 (6.7–17.6)
Shared bedroom with known case-patient	6 (31.6)	10 (1.2)	<0.001	25.5 (10.3–63.1)
Shared kitchen with known case-patient	4 (21.1)	11 (1.4)	<0.001	15.5 (5.4–44.2)
Shared bathroom with known case-patient	6 (31.6)	10 (1.2)	<0.001	25.5 (10.3–63.1)
Shared meal with known case-patient	5 (26.3)	11 (1.4)	<0.001	19.4 (7.5–50.3)
Shared transportation to/from place of employment with known case-patient	5 (26.3)	18 (2.2)	<0.001	11.8 (4.9–28.5)
Reported nondirect contact with case-patient‡	4 (21.1)	11 (1.4)	<0.001	15.5 (5.4–44.2)

\*CoV, coronavirus; MERS, Middle East respiratory syndrome; RR, risk ratio.  
†By  $\chi^2$  test.  
‡No physical contact, nonphysical contact (including talk to the known case-patient).

where persons with undiagnosed MERS had been cared for. In August 2015, hospital B, reportedly the primary occupation location for 2 women who were MERS-CoV positive according to PCR, was the location of a small cluster of laboratory-confirmed MERS cases (n = 5). Unfortunately, viral genetic sequencing was conducted on only 1 of those patients (22); without further epidemiologic and sequencing data from other patients in this cluster, or from the laboratory-confirmed patients in the small cluster in hospital B in August 2015, we cannot surmise further.

The time lag between identification of MERS patients in hospital B in August 2015 and the timing of this outbreak in October 2015 suggests that persons with subclinical cases may have been in or working in this hospital during August–October 2015; however, because testing for MERS-CoV in Saudi Arabia was substantial (29), missing symptomatic cases was unlikely. A subject of some debate and recent focus has been the potential role of mildly symptomatic or asymptomatic infections and possible environmental contamination in the spread of MERS-CoV in healthcare facilities (22,30–33). The rapid initiation of this investigation and use of an existing protocol (34) (developed for such use after the rapid isolation of close contacts regardless of the development of symptoms and the implementation of a no-fly policy among residents of the compound until the full 14-day follow-up was completed) probably limited further human-to-human transmission inside and potentially outside of Saudi Arabia.

Our study highlights the potential role of healthcare workers not responsible for direct patient care (e.g., hospital cleaners) in the spread of MERS-CoV. Often, hospital cleaning staff may be from other countries, may speak several languages, and may be missed by efforts to increase IPC specific to MERS-CoV. Specific MERS-CoV IPC training should be directed to cleaning staff in healthcare facilities, in addition to healthcare providers, in appropriate languages, particularly to protect them from infection and from facilitating virus spread within the healthcare facility.

For the 8 women with RT-PCR–confirmed infection, antibody titers ranged from 1:10 to 1:80 by PRNT and from 1:20

to 1:160 by ppNT. For 9 of the 19 women with confirmed evidence of infection by RT-PCR, serologic testing, or both, for whom follow-up serum samples were available 3 months after the putative exposure, 7 women had PRNT titers of <1:20 and 1 woman had ppNT titers of <1:20. Thus, the ppNT antibody test was somewhat more sensitive for detecting evidence of past infection. A ppNT titer of 1:20 is therefore an optimal indicator of past infection in seroepidemiologic assays. The ppNT, although more sensitive, correlated well with PRNT among persons with RT-PCR–confirmed MERS-CoV infection (35) and was uniformly negative in serum from persons in areas where MERS-CoV is not endemic (e.g., Hong Kong [36]). For this study, we categorized those without RT-PCR evidence of MERS-CoV infection but PRNT or ppNT antibody titers  $\geq$ 1:20 as being MERS-CoV infected.

Of the 8 women who had RT-PCR–confirmed infection, 2 were asymptomatic, as were 6 of the 11 women whose diagnosis was made solely by serologic testing. Serologic studies of cohorts of patients positive for MERS-CoV by RT-PCR have shown that milder disease and asymptomatic infections may not be associated with detectable serologic responses (37). Thus, our serologic testing probably underestimates the true number of MERS-CoV infections that may have occurred. However, our data provide evidence that even asymptomatic infections can sometimes lead to detectable serologic responses and that such investigations are useful. Furthermore, the serologic results at 5 months after putative exposure show evidence of antibody titers waning to below diagnostic limits in some patients but also show that antibodies may remain detectable in others. This information is useful when interpreting seroepidemiologic studies in high-risk populations.

Our study had several limitations. Because of multicollinearity of the exposure variables (38), the accuracy of individual predictors may be compromised. The lack of collection of acute blood samples during the outbreak limited our ability to detect seroconversion. In addition, we were not able to conduct sequencing for patients of this outbreak and therefore were not able to use this information to potentially confirm that all 19 infected women acquired their infection from a common source or to identify the source of the outbreak.

The rapid initiation of contact tracing, isolation, and subsequent investigation probably contributed to the quick halt of human-to-human transmission in this outbreak. On the basis of the possible source of infection, to reduce secondary human-to-human transmission outside the occupational setting, our study indicates that IPC measures introduced in healthcare facilities should focus on not only healthcare personnel but also those working within the wider facility, including cleaners.

### Acknowledgments

We thank the KSA Ministry of Health field staff for their support in collecting biological samples and administering questionnaires during the study.

Serologic testing for this study was supported by a research grant from the US National Institutes of Health (contract no. HHSN272201400006C).

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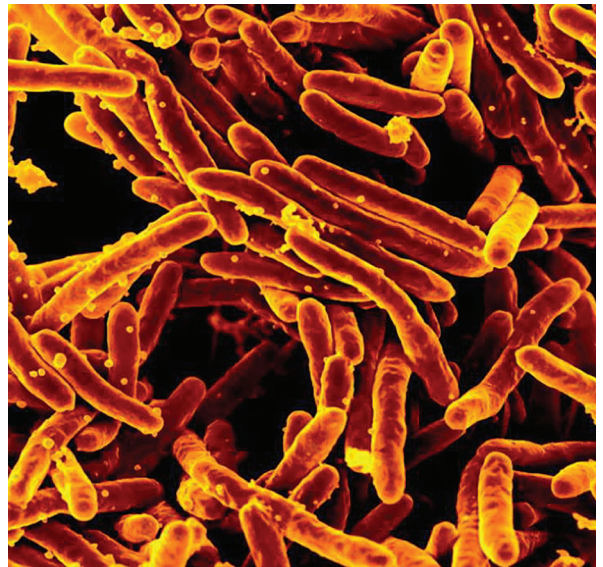
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## EID podcast Tuberculosis Surveillance and Control in Puerto Rico



The WHO has recognized Puerto Rico as a promising candidate for the elimination of tuberculosis by 2035, but many challenges remain before this goal can be achieved. Before going forward, researchers must look back at the historical patterns and developments that have brought them here.

In this EID podcast, Dr. Emilio Dirlikov, a CDC epidemiologist, tells the story of TB surveillance in Puerto Rico from 1898 to 2015.

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# Transmissibility of MERS-CoV Infection in a Closed Setting, Riyadh, Saudi Arabia, 2015

## Appendix

### Outbreak Investigation Questionnaire

The following questionnaire was administered in groups of 15 participants by a trained interviewer from the Ministry of Health or Institut Pasteur. The interviewer read each question aloud while the participants wrote their answers directly into the questionnaire.

### MERS-CoV Outbreak Investigation Questionnaire

#### GENERAL INFORMATION

#### PANGKALAHATANG IMPORMASYON

1. **Subject ID:** \_\_\_\_\_

Numero ng ID: \_\_\_\_\_

2. **Subject Name: First name** \_\_\_\_\_ **Surname** \_\_\_\_\_

Panglan: \_\_\_\_\_ Apelyido: \_\_\_\_\_

3. **Date of interview (dd/mm/yyyy):** \_\_\_\_/\_\_\_\_/\_\_\_\_

Petsa ng pakikipanayam o interbyu (araw/buwan/taon) \_\_\_\_/\_\_\_\_/\_\_\_\_

4. **Location of Interview** (*Region, City, Province*):

\_\_\_\_\_

Lugar ng pakikipanayam (Rehiyon/Syudad/Probinsya):

\_\_\_\_\_

5. **Language used for interview:**  English  Filipino  Other, please specify \_\_\_\_\_

Gamit na salita sa pakikipanayam:  English  Tagalog/Filipino  At iba pa,  
(tukuyin)\_\_\_\_\_

6. **Gender (tick one):**  Female  Male

Kasarian (lagyan ng tsek ang isa): Babae  Lalake

7. **Place of primary residence of subject (address):**

\_\_\_\_\_

Lugar ng pangunahing paninirahan ng paksa/pasyente (address):

\_\_\_\_\_

8. **How long have you lived in this complex?** \_\_\_\_\_ months \_\_\_\_\_ year

Gaano katagal ka ng nanirahan sa complex na ito: \_\_\_\_\_ buwan \_\_\_\_\_ taon

9. **Date of birth:** \_\_\_\_/\_\_\_\_/\_\_\_\_ (mm/dd/yyyy)

Petsa ng kapanganakan: \_\_\_\_/\_\_\_\_/\_\_\_\_ (buwan/araw/taon)

10. **What is your current marital status?**  Single  Married  Divorce  Widowed

Ano ang iyong kasalukuyang katayuan civil?  Single  Kasal  Diborsyado/Dibosyada   
Byudo/byuda

**a. If you are married, does your husband live in KSA?**  Yes  No

Kung ikaw ay may-asawa, ang iyong asawa ay nakatira sa KSA?  Oo  Hindi

**b. If yes, where does he live? (location, city province)** \_\_\_\_\_

Kung Oo, saan siya nakatira? (lokasyon, syudad/probinsya) \_\_\_\_\_

**c. If yes, how often do you visit your husband?**  More than once a week  once a week  once a month

Kung oo, gaano kadalas mo bisitahin ang iyong asawa?  Higit sa isang beses sa isang lingo

minsan sa isang lingo

minsan sa isang buwan

**11. What is your nationality?**  Filipino  Indian  Indonesian  Sri Lankan  Other  
\_\_\_\_\_

Ano ang iyong nasyonalidad?  Filipino  Indian  Indonesian  Sri Lankan  At iba pa:  
\_\_\_\_\_

**12. How long have you been living in Saudi Arabia?** \_\_\_\_\_

Gaano katagal ka na naninirahan sa Saudi Arabia? \_\_\_\_\_

### HOUSING EXPOSURES

**13. What building do you live in ?** \_\_\_\_\_

Anong building ang iyong tinitirhan? \_\_\_\_\_

**14. What floor do you live on?**  Ground floor  First floor  Second floor

Sa anong floor ka nakatira?  Palapag  Unang palapag  Pangalawang palapag

**15. How many women live in your villa with you in total?** \_\_\_\_\_ total

Gaano karaming mga kababaihan ang nakatira sa inyong villa? \_\_\_\_\_ (lahat)

i. **Ground floor:** \_\_\_\_\_ Palapag: \_\_\_\_\_

ii. **First floor:** \_\_\_\_\_ Unang palapag: \_\_\_\_\_

iii. **Second floor:** \_\_\_\_\_ Pangalawang palapag: \_\_\_\_\_

**16. What is your bedroom number?**  One  Two  Three

Ano ang iyong bedroom number?  Una/Isa  Panglawala/Dalawa  Pangatlo/Tatlo

**17. How many women share the bedroom with you?** \_\_\_\_\_ women

Gaano karaming mga kababaihan kasama/kabahagi mo sa kwarto? \_\_\_\_\_ babae

**18. Do you have a bottom or top bunk?**  Top  Bottom

Mayroon ba kayong isang ibaba o itaas bunk?  Itaas  Ibaba

**18.1 Do you have a personal electronic fan in your bed space?**  Yes  No

Mayroon ba kayong isang personal na elektronikong fan sa iyong kwarto?  Meron  Wala

**18.2 Do you use a curtain on your bunk bed?**  Yes  No

Gumagamit ka ba ng isang kurtina sa iyong bunk bed?  Oo  Hindi

**19. Is there a window in your bedroom?**  Yes  No

Mayroon bang bintana sa iyong kwarto?  Meron  Wala

**19.1 If yes, is this window covered?**  Yes  No

Kung Oo, may takip ba ang bintana na ito?  Meron  Wala

**20. Is there a working air conditioner in your bedroom?**  Yes  No

Mayroon bang gumaganang air conditioner sa iyong kwarto?  Meron  Wala

**21. How many bathrooms are on your floor?**  1  2  3

Ilan ang mga banyo sa iyong palapag(floor)?  1  2  3

**21.1 How many women share your bathroom?** \_\_\_\_\_ women  Unknown

Gaano karaming mga babae ang gumagamit ng iyong banyo? \_\_\_\_\_babae

**22. Is there a kitchen on your floor?**  Yes  No

Mayroon bang isang kusina sa iyong palapag?  Meron  Wala

**22.1 If not, which kitchen(s) do you use (check all that apply)?**

Ground floor  First floor  Second Floor

Kung wala, alin or saan (mga) kitchen ang iyong ginagamit (i-check ang lahat ng naaangkop)?

Palapag  Unang palapag  Pangalawang palapag

**22.2 How many women share the kitchen you use?** \_\_\_\_\_ women  Unknown

Gaano karaming mga babae ang gumagamit ng iyong kusina? \_\_\_\_\_

**22.3 Where is your refrigerator?** Bedroom Kitchen both Bedroom and Kitchen

Saan ang iyong refrigerator? Silid Tulugan Kusina Pareho Silid tulugan at Kusina

**23. Is there a washing machine on your floor?**  Yes  No

Mayroon bang isang washing machine sa iyong palapag?  Meron  Wala

**23.1 Do you use the washing machine to clean your clothes?**  Yes  No

Ginagamit mo ba ang washing machine upang linisin ang iyong mga damit? Oo  Hindi

**23.2 If not, which washing machine do you use?**  Ground floor First floor  Second floor  Don't use washing machine

Kung Hindi, ano o saan ang washing machine ang ginagamit mo?  Palapag  Unang Palapag  Pangalawang palapag  Hindi gumagamit ng washing machine

**23.3 How many women share the washing machine you use?** \_\_\_\_\_ women

Gaano karaming mga babae ang kashare mo sa ginagamit mong washing machine? \_\_\_\_\_babae

**24. Have you seen other animals or pests at your home?**  YES  NO

Mayroon bang mga hayop o mga peste sa iyong bahay?  Meron  Wala

**24.1If yes, which other animals have you seen in or around your home?**  Cats  Dogs

Rats  Mice  Bats  Cockroaches  Other \_\_\_\_\_

Kung Meron, anong mga hayop ang makikita sa paligid ng iyong bahay?

Pusa  Aso  Daga  Bubwit  Paniki  Ipis  At iba pa:\_\_\_\_\_

**25. Did you attend any social gatherings within the residential complex in the last two months?**  Yes  No

Ikaw ba ay dumalo o nakadalo sa anumang social na pagtitipon sa loob ng residential complex nyo sa huling dalawang buwan?  Oo  Hindi

**25.1.If yes, what was the gathering for (e.g., EID)(add some answers plus an other with open ended)**

Kung Oo, ano or para saan ang pagtitipon na iyon? (magdagdag ng ilang mga sagot kasama ang isa pa or mga event na di pa natapos)

Gathering 1: (description) \_\_\_\_\_ Number of women attending (estimate):  
\_\_\_\_\_

Pagtitipon 1: (isalarawan) \_\_\_\_\_ Bilang ng mga kababaihan na dumalo o dadalo \_\_\_\_\_

Gathering 2: (description) \_\_\_\_\_ Number of women attending (estimate):  
\_\_\_\_\_

Pagtitipon 2: (isalarawan) \_\_\_\_\_ Bilang ng mga kababaihan na dumalo o dadalo \_\_\_\_\_

**26. Do you socialize with the women in your villa?**  Yes  No

Ikaw ba ay nakikisalamuha sa mga babae sa iyong villa?  Oo  Hindi

**26.1.If yes, what socialization do you do?**

Watch TV/movies/you tube together on a shared laptop/computer  play volleyball

Attend parties  share meals  sing songs

Other \_\_\_\_\_

Kung Oo, anong klase ng kaganapan or pagtitipon ang ginagawa mo?

Magkasama sa panonood ng TV / pelikula / Youtube sa isang laptop / computer

Dumalo sa mga party  Magkasalo sa pagkain  Kumanta /Kantahan

At iba pa:

**27. Did you attend any social gathering last month?**  Yes  No

Dumalo ka ba ng anumang mga pagtitipon noong nakaraang buwan?  Oo  Hind

**27.1 If yes when?** \_\_\_\_\_ Kung Oo, kalian?  
\_\_\_\_\_

**27.2 What was the nature of the social gathering?** \_\_\_\_\_

Ano ang klase ng pagtitipon? \_\_\_\_\_

## CONTACTS

**28. Have you had any contact with a known or suspected MERS-CoV patient?**  Yes  No

No

Ikaw ba ay nagkaroon ng anumang contact sa isang kilala o pinaghihinalang mga pasyente MERS-CoV?  Oo  Hindi

**28.1 If yes, who did you come in contact with? (name)** \_\_\_\_\_

Kung Oo, sino ito? (ibigay ang pangalan) \_\_\_\_\_

**28.2 yes, what was the nature of the contact (choose all that apply)**

Shared a bedroom  shared a kitchen  shared a bathroom  shared a meal

shared transportation to or from work

had direct contact with patient (e.g., hugged, touched patient)

had no direct contact but spoke to patient (within 3 feet)...

Other \_\_\_\_\_

Kung Oo, ano o paano kayo nagkaroon ng contact (piliin ang lahat na naaangkop)

Magkasama or share ng isang kwarto  Magkashare ng kusina

Magkashare ng banyo  Magkashare ng pagkain

Magkashare ng sasakyan papunta at pauwi ng trabaho

nagkaroon ng direktang kontak sa mga pasyente (eg, niyakap, hinawakan pasyente)

walang direktang contact ngunit nakipag ugap sa pasyente (sa loob ng 3 talampakan)

At iba pa \_\_\_\_\_

**29 Have you had contact with a roommate or housemate with respiratory, gastrointestinal symptoms or fever in the last 4 weeks?**  Yes  No

**29.1 If yes, who did you have contact with? (list)**

**Contact 1:** \_\_\_\_\_

**Contact 2:** \_\_\_\_\_

**Contact 3:** \_\_\_\_\_

**Contact 4:** \_\_\_\_\_

**(add more if necessary)**

Nagkaroon ng kontak sa isang kasama sa kuwarta o kasambahay na may sakit sa paghinga, Gastrointestinal sintomas o lagnat sa huling 4 na linggo?  Oo  Hindi

Kung Oo, sino or kani-kanino ka nakipag-ugnayan? (listahan)

Contact 1: \_\_\_\_\_

Contact 2: \_\_\_\_\_

Contact 3: \_\_\_\_\_

Contact 4: \_\_\_\_\_

(add more if necessary)

## OCCUPATIONAL EXPOSURES

**30 Where do you work?** \_\_\_\_\_

Saan ka nagtatrabaho? \_\_\_\_\_

**31 What building are you working in?** \_\_\_\_\_

Ano ang pangalan ng gusali o lokasyon na pinagtatrabahuhan mo?

**32 If working in Princess Nora University, do you have contact with any students or faculty?**  Yes  No

Kung ikaw ay nagtatrabaho sa Princess Nora University, Mayroon ba kayong ka-ugnayan sa anumang

mga mag-aaral o mga kasapi na guro?  Oo  hindi

**32.1 If yes, were any of these students/faculty members sick in the last two weeks?**

Yes  No

Kung Oo, meron ba sa alinman nitong mga mag-aaral o kasaping mga guro ay may sakit sa huling

dalawang linggo?  Oo  hindi

**33 Where is your current primary employment?** \_\_\_\_\_

**33.1 How long have you worked at this location?** \_\_\_\_ Years \_\_\_\_ Months

**33.2 What is the address of your work?** \_\_\_\_\_

Saan ang iyong kasalukuyang pangunahing trabaho? \_\_\_\_\_

Gaano ka na katagal nagtrabaho sa lokasyon na ito? \_\_\_\_\_ taon \_\_\_\_\_ buwan

Ano ang address ng iyong trabaho? \_\_\_\_\_

**34 What is/are your job/jobs at this location? (tick all that apply)**

Technician  Cleaning  Engineer  Other \_\_\_\_\_

**34.1 Of the listed options, which you selected, which is your primary job?**

\_\_\_\_\_

Ano ang / iyong mga trabaho / sa lokasyon na ito? (lagyan ng tsek ang lahat ng naaangkop)

Tekniko  Paglilinis  Engineer  At iba pa \_\_\_\_\_

Sa mga nakalista pagpipilian, na kung saan na iyong pinili, ano sa mga ito ang iyong pangunahing trabaho? \_\_\_\_\_

**35 How often in the week do you work at this location?**

**Day Working? Hour start Hour end**

Monday  YES \_\_\_\_\_

Tuesday  YES \_\_\_\_\_

Wednesday  YES \_\_\_\_\_

Thursday  YES \_\_\_\_\_

Friday  YES \_\_\_\_\_

Saturday  YES \_\_\_\_\_

Sunday  YES \_\_\_\_\_

Gaano kadalas sa isang linggo ka nagtatrabaho sa lokasyon na ito?

Araw Nagtatrabaho? Umpisa ng trabaho Tapos ng Trabaho

Lunes  Oo \_\_\_\_\_

Martes  Oo \_\_\_\_\_

Miyerkules  Oo \_\_\_\_\_

Huwebes  Oo \_\_\_\_\_

Biyernes  Oo \_\_\_\_\_

Sabado  Oo \_\_\_\_\_

Linggo  Oo \_\_\_\_\_

**36 If you hold only one job, what do you do in the evenings after 14:00 or 15:00 until you go to sleep? \_\_\_\_\_**

Kung ikaw ay mayroon lamang isang trabaho, ano ang ginagawa mo sa gabi sa pagitan ng 14:00 o 15:00? \_\_\_\_\_



**37 How frequent do you go for shopping?**

\_\_\_\_\_

Gaano ka kadalas pumunta para sa pamimili? \_\_\_\_\_

**37.1 When was the last time (date) that you went for shopping?** \_\_\_\_\_

Kailan (petsa) ka huling nagpunta para sa pamimili? \_\_\_\_\_

**37.2 Where did you do your last shopping?** \_\_\_\_\_

Saan ka huling namili? \_\_\_\_\_

**38 Do you usually play volleyball with other sisters in the compound?** \_\_\_\_\_

Ikaw ba ay karaniwang naglalaro ng volleyball kasama ng iba pang mga babae sa compound?

\_\_\_\_\_

**38.1 When was the last time you played volleyball with other sisters in the compound?**

\_\_\_\_\_

Kailan ka huling naglaro ng volleyball kasama ng iba pang mga babae sa compound?

**39 Do you usually watch TV with roommates/ housemates in the compound?**

\_\_\_\_\_

Ikaw ba ay karaniwang nanonood ng TV kasama ng iyong mga roommate / kasambahay sa compound? \_\_\_\_\_

**39.1 If yes, when was the last time you watched TV with roommates/ housemates in the compound?** \_\_\_\_\_

Kung Oo, kailan ang huling panahon na nanood ka ng TV kasama ng iyong mga roommate / kasambahay sa compound? \_\_\_\_\_

**40 What personal protective equipment do you usually wear when working at your primary job?**

No protective equipment used  Gloves  Coveralls

Dust masks  Boots or boot covers  Respirators

Eye protection (goggles, safety glasses)  Others: \_\_\_\_\_

Ano ang mga personal na proteksiyon kagamitan at karaniwang iyong isinusuot kapag nagtatrabaho sa iyong pangunahing trabaho?

Walang kagamitang pangprotekyonna ginamit  Guwantes

Coveralls  Dust masks  Bota  Respirators

Proteksyon sa mata (goggles)  At Iba pa: \_\_\_\_\_

**41 How often do you usually wash your hands while working at your primary job (check all)**  **At mealtimes**  **Before and after each animal related task**

**At bathroom times**  **The beginning and end of the day**  **Rarely**

Gaano kadalas ka kadalasang naghuhugas ng inyong mga kamay habang nagtatrabaho sa iyong pangunahing trabaho (i-check ang lahat)

sa oras ng kainan  Bago at pagkatapos ng bawat gawain na may kaugnayan sa hayop

sa oras ng pagba banyo  Sa pag simula at pagtatapos ng araw  Madalang

ANIMAL EXPOSURES IN/AROUND THE HOME where you live

**42. Were any animals (e.g. camels, sheep, goats, cattle, horses, cats, dogs, birds) kept in or around your home in the last six months?**  YES  NO  UNKNOWN

Mayroon bang mga hayop (eg kamelyo, tupa, kambing, baka, kabayo, pusa, aso, ibon) sa inyong paligid ng iyong tahanan sa huling anim na buwan?  Meron  Wala  Di Alam

**42.2 Which animals?**

kamelyo  tupa  kambing  baka  kabayo  pusa  aso,  bon

**43. In the last six months, did you have any contact with any carcasses, body fluids, secretions, urine or excrement of camels in or around your home?**  YES  NO  UNKNOWN

Sa huling anim na buwan, ikaw ba ay mayroon anumang contact sa mga bangkay, likido sa katawan, secretions, ihi o dumi ng kamelyo sa o sa paligid ng iyong bahay?  Meron  Wala  Di Alam

**44. In the last six months, did you have any contact with any camel bedding, stray of feed in or around your home?**  YES  NO  UNKNOWN

Sa huling anim na buwan, ikaw ba ay mayroon anumang contact sa mga gamit ng kamelyo (tulugan), o nagkalat/nagbigay ng kanilang mga pagkain sa paligid ng iyong bahay?  Oo  Hindi  Di Alam

**45. Do others living in your household (e.g., domestic help or relative) frequently visit or work on a farm or market where camels are kept or sold?**  YES  NO  UNKNOWN

Mayroon ba sa ibang nakatira sa inyong sambayan (eg, domestic helper/ka tulong o kamag-anak) ang madalas bumisita o nagtatrabaho sa isang sakahan o pamilihan kung saan nagbebenta ng kamelyo?  Meron  Wala  Di Alam

**46. Have others living in your household (e.g., domestic help or relative) had visited or worked in the in the past 2 weeks at a farm or market where camels are kept or sold?**

YES  NO  UNKNOWN

Sa ibang nakatira sa inyong sambahayan (eg, domestic helper/ka tulong o kamag-anak) bumisita ba sila o nagtrabaho sa isang sakahan o pamilihan ng kamelyo sa huling dalawang (2) linggo?  Oo  Hindi  Di Alam

**47. Have others living in your household (e.g., domestic help or relative) had direct contact with camels in the past 2 weeks?**  YES  NO  UNKNOWN

Sa ibang nakatira sa inyong sambahayan (eg, domestic helper/ka tulong o kamag-anak) nagkaroon ba ng direktang kontak sa mga kamelyo sa nakaraan 2 linggo?  Oo  Hindi  Di Alam

## FOOD EXPOSURES

**The following series of questions are focused on food exposures in the last month**

Ang mga sumusunod na serye ng mga katanungan ay nakatutok sa mga exposure ng pagkain sa nakaraang buwan

**During the past six months, how often on average did you consume any of the following products:**

Sa panahon ng nakaraang anim na buwan, gaano kadalas sa average na ubusin mo ang alinman sa mga sumusunod na produkto

**48. Did you drink unpasteurized camel milk?**  YES  NO  UNKNOWN

Uminom ka ba unpasteurized kamelyo gatas?  Oo  Hindi  Di Alam

**49. Did you use camel urine, for example, for medicinal purposes?**  YES  NO  UNKNOWN

Sa layunin ng panggagamot, gumamit ka ba ng ihi ng kamelyo?  Oo  Hindi  Di Alam

**50. Did you drink camel urine?**  YES  NO  UNKNOWN

Uminom ka ba ng ihin ng kamelyo?  Oo  Hindi  Di Alam

## TRAVEL HISTORY AND EXPOSURES

**51. During the last 2 months have you travelled outside KSA?**  YES  NO  UNKNOWN

Sa panahon ng huling 2 buwan ikaw ba ay nakapaglakbay sa labas KSA?  Oo  Hindi  Di Alam

**51.1 If yes, what countries/regions have you visited?**

*Country Region/City Approximate Dates*

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Kung oo, ano mga bansa / rehiyon ang iyong mong binisita?

*Bansa Rehiyon/Syudad Petsa*

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

**52. While traveling, have you attended any mass gatherings (e.g., weddings, festivals or religious pilgrimages) outside KSA where there were large numbers of people together?**  YES  NO  UNKNOWN

**52.1 If yes, specify event(s) and location:**

\_\_\_\_\_

Sa pahanon ng iyong naglalakbay, pumasok o dumalo kaba sa anumang malakihang pagtitipon (halimbawa, weddings, festival o pilgrimages relihiyon) sa labas ng KSA kung saan mayroong malaking bilang ng mga tao na magkasama?  Oo  Hindi  Di Alam

Kung Oo, tukuyin ang (mga) kaganapan at lokasyon:

\_\_\_\_\_

**53. When you travelled, did you have direct or indirect contact with dromedary camels while outside of KSA?**  YES  NO  UNKNOWN

**54. In the last month, have you visit any health care facility outside of KSA?**  YES  NO  UNKNOWN

**54.1 If yes, where (city, country, hospital name)** \_\_\_\_\_

Sa mga nakaraang buwan, ikaw ba ay bumisita sa anumang health care facility sa labas ng KSA?  Oo  Hindi  Di Alam

Kung oo, saan (Syudad, Bansa, pangalan ng ospital) \_\_\_\_\_

## SIGNS AND SYMPTOMS

Palatandaan at Sintomas

**55. Are you sick today with fever and/or cough?**  YES  NO

**a. If yes, when did your symptoms start (DD/MM/YYYY):** \_\_\_\_/\_\_\_\_/\_\_\_\_

Ikaw ay may sakit ngayon at may lagnat at / o pag-ubo?  Oo  Hindi

Kung Oo, kailan nagsimula ang iyong mga sintomas

(petsa: araw/buwan/taon):\_\_\_\_/\_\_\_\_/\_\_\_\_

**56. Did you experience any respiratory signs or symptoms during the last four weeks?**

YES  NO  UNKNOWN

**If yes, when did these symptoms start (DD/MM/YYYY):** \_\_\_\_/\_\_\_\_/\_\_\_\_

Nakaranas ka ba ng anumang respiratory (sakit sa paghinga) na palatandaan o sintomas sa loob ng huling apat na linggo?  Oo  Hindi  Di Alam

Kung Oo, kailan nagsimula ang mga sintomas na ito (petsa:

araw/buwan/taon):\_\_\_\_/\_\_\_\_/\_\_\_\_

**57. If you answered yes to either #1 or #2, please indicate which symptoms:**

*Symptom Today Last 4 weeks*

Dry Cough  YES  NO  UNKNOWN  YES  NO  UNKNOWN

Productive Cough  YES  NO  UNKNOWN  YES  NO  UNKNOWN

Phlegm  YES  NO  UNKNOWN  YES  NO  UNKNOWN

Runny nose  YES  NO  UNKNOWN  YES  NO  UNKNOWN

Sore throat  YES  NO  UNKNOWN  YES  NO  UNKNOWN

Fever  YES  NO  UNKNOWN  YES  NO  UNKNOWN

Shortness of breath  YES  NO  UNKNOWN  YES  NO  UNKNOWN

Muscle pain  YES  NO  UNKNOWN  YES  NO  UNKNOWN

Diarrhea  YES  NO  UNKNOWN  YES  NO  UNKNOWN

Chest Pain  YES  NO  UNKNOWN  YES  NO  UNKNOWN

Vomiting  YES  NO  UNKNOWN  YES  NO  UNKNOWN

Rashes  YES  NO  UNKNOWN  YES  NO  UNKNOWN

Kung sumagot ka ng Oo sa alinman sa # 1 o # 2, mangyaring ipahiwatig kung aling mga sintomas:

*Sintomas Kasalukuyang Araw (Today) Huling 4 na Linggo (Last 4 weeks)*

Tuyong Ubo  OO  HINDI  DI MATUKOY  OO  HINDI  DI MATUKOY

Produktibong ubo  OO  HINDI  DI MATUKOY  OO  HINDI  DI MATUKOY

Plema  OO  HINDI  DI MATUKOY  OO  HINDI  DI MATUKOY

Sinisipon  OO  HINDI  DI MATUKOY  OO  HINDI  DI MATUKOY

Namamagang lalamunan  OO  HINDI  DI MATUKOY  OO  HINDI  DI MATUKOY

Lagnat  OO  HINDI  DI MATUKOY  OO  HINDI  DI MATUKOY

Pangangapos ng hininga  OO  HINDI  DI MATUKOY  OO  HINDI  DI MATUKOY

Pananakit ng kalamnan  OO  HINDI  DI MATUKOY  OO  HINDI  DI MATUKOY

Pagtatae  OO  HINDI  DI MATUKOY  OO  HINDI  DI MATUKOY

Pananakit ng dibdib  OO  HINDI  DI MATUKOY  OO  HINDI  DI MATUKOY

Pagsusuka  OO  HINDI  DI MATUKOY  OO  HINDI  DI MATUKOY

Pamamantal  OO  HINDI  DI MATUKOY  OO  HINDI  DI MATUKOY

**58. Did you seek medical care?  YES  NO  UNKNOWN**

**If yes, where did you seek medical care (name and address of medical facility)?**

\_\_\_\_\_

**If yes, when did you seek medical care (DD/MM/YYYY):** \_\_\_/\_\_\_/\_\_\_\_\_

Ikaw ba ang kumonsulta sa manggagamot?  OO  HINDI  DI MATUKOY

Kung Oo, saang ospital ka nagpakonsulta? (pangalan at address ng mga medikal na pasilidad)?

\_\_\_\_\_

Kung Oo, kailan ka nagpakonsulta? (petsa: araw/buwan/taon): \_\_\_/\_\_\_/\_\_\_\_\_

**59. Where you hospitalized during the course of your illness?  YES  NO  UNKNOWN**

**59.1 If yes, when were you hospitalized (DD/MM/YYYY):** \_\_\_/\_\_\_/\_\_\_\_\_

**59.2 If yes, which hospital did you receive treatment(s)? (name and address)**

\_\_\_\_\_

Ikaw pa ay na-ospital sa mga panahon ng iyong pagkaskasakit?  OO  HINDI  DI MATUKOY

Kung Oo, kelan ka na-ospital (petsa: araw/buwan/taon): \_\_\_\_/\_\_\_\_/\_\_\_\_

Kung Oo, saan o anong ospital ka nakatanggap ng (mga) paggamot? (pangalan at address ng ospital) \_\_\_\_\_

## MEDICAL HISTORY AND RELATED EXPOSURES

### KASAYSAYAN MEDIKAL AT MGA KAUGNAY NA PAGKAKALANTAD

**60. Do you currently smoke tobacco (ex. cigarettes, cigars, shisha)?**

Daily  Less than daily  Not at all  Unknown

Ikaw ba sa kasalukuyan ay nagsisigarilyo (nagtatabako)? (ex. Sigarilyo, tabako, shisha)?

Araw-araw  Madalang sa araw-araw  Hindi  Di Matukoy

**61. Do you share the same cigarette, cigar, shisha?  YES  NO  UNKNOWN**

Ikaw ba ay nakikibahagi ng parehong sigarilyo, cigar, shisha?  OO  HINDI  DI MATUKOY

**62. Have you smoked tobacco daily in the past?  YES  NO  UNKNOWN**

Ikaw ba ay nagsisigarilyo ng tabako araw-araw sa mga panahong nakalipas ?  OO  HINDI  DI MATUKOY

**63. Is there any hereditary disease running in your family?  YES  NO  UNKNOWN**

**63.1 If yes, please specify the disease(s):**

\_\_\_\_\_

Mayroon ba sa iyong pamilya ang anumang mga sakit na namamana?  OO  HINDI  DI MATUKOY

Kung Oo, mangyaring tukuyin ang (mga) sakit: \_\_\_\_\_

**64. Do you currently have any chronic illness (ex. asthma, cancer, diabetes)?  YES  NO  UNKNOWN**

**64.1 If yes, please specify the disease(s):** \_\_\_\_\_

Sa kasalukuyan mayroon ka bang anumang mga hindi gumagaling na sakit (ex. Hika, kanser, diabetes)?  OO  HINDI  DI MATUKOY

Kung Oo, mangyaring tukuyin ang (mga) sakit: \_\_\_\_\_

**65. Have you taken medications regularly in the last six months?**  YES  NO  UNKNOWN

**65.1 If yes, what medications do you regularly take? (list all)**

---

---

Ikaw ba ay may mga gamot na regular na iniinom sa huling anim na buwan?  OO  HINDI  DI MATUKOY

Kung Oo, anong gamot ang regular mong iniinom? (ilista ang lahat)

---

---

**66. Have you taken any traditional medications in the last six months?**  YES  NO  UNKNOWN

**If yes, which traditional medications (list all)**

---

---

Ikaw ba ay may iniinom na anumang tradisyonal na mga gamot sa huling anim na buwan?  OO  HINDI  DI MATUKOY

Kung Oo, anong tradisyunal na gamot? (ilista ang lahat)

---

---

**67. What is your height \_\_\_\_\_ cm** Ano ang iyong taas \_\_\_\_\_ cm

**68. What is your weight \_\_\_\_\_ kg** Ano ang iyong timbang \_\_\_\_\_ kg

**69. How many bars of soap to you use per month? \_\_\_\_\_**

Gaano karaming mga bar ng sabon ang nagagamit mo sa bawat buwan? \_\_\_\_\_

**70. How frequently do you bathe? \_\_\_\_\_ per day/per week**

Gaano ka kadalas maligo? \_\_\_\_\_ beses isang araw/ isang lingo

**71. What is the highest level of education?**  Primary school  High School  University  Post Graduate degree

Ano ang pinakamataas na antas ng iyong edukasyon?  Mababang Paaralan  Mataas na paaralan  Unibersidad  Post Graduate degree

**72. Have you visited anyone in the hospital in the last 2 months?**  YES  NO  UNKNOWN



If yes, was the person sick with respiratory illness (cough, breathing problems)?  YES  NO  UNKNOWN

72.1 If yes, at what hospital (regions, city, district) \_\_\_\_\_

72.2 If yes, what was your relationship to the person in the hospital?  Close family

Extended family  Friend  Other \_\_\_\_\_

Ikaw ba ay mayroong sinumang binisita sa ospital sa huling 2 buwan?  OO  HINDI  DI MATUKOY

Kung Oo, ang taong ito ba ay may sakit paghinga/respiratory (tulad ng ubo, at iba pang mga problema sa paghinga)?  OO  HINDI  DI MATUKOY

Kung Oo, saan o anong ospital (mga rehiyon, lungsod, distrito) \_\_\_\_\_

Kung oo, ano ang iyong relasyon sa taong nasa ospital?  Malapit na kamag-anak

Extended family  Kaibigan  At iba pa \_\_\_\_\_

73. **Had you heard of MERS Coronavirus before this outbreak?**  YES  NO

73.1 **If yes, what was the source of your information?**  Ministry of Health  TV

Supervisor  Other \_\_\_\_\_

Mayroon ka bang napapakinggan tungkol sa MERS Coronavirus noon pa man bago pa ito naging outbreak?  OO  HINDI

Kung Oo, saan o ano ang pinagmulan ng iyong impormasyon?  Ministry of Health  TV

Supervisor  Other \_\_\_\_\_

74. **In the last month, how many times have you been visited by a health care professional about MERS-CoV?** \_\_\_\_\_

74.1 **How many times have samples been collected from you?** \_\_\_\_\_

74.2 **What samples were collected?**  NP  OP  Blood  other \_\_\_\_\_

74.3 **What dates were samples collected from you?**

Sa nakaraang buwan, ilang beses ka na binisita ng isang propesyonal ng pangkalusugang pag-aalaga tungkol sa MERS-CoV? \_\_\_\_\_

Ilang beses na samples na nakolekta mula sa iyo? \_\_\_\_\_

Anong sample ang nakolekta sa iyo?  NP  OP  Blood  At iba pa \_\_\_\_\_

Anong petsa ang sample na nakolekta mula sa iyo? \_\_\_\_\_

75 **May we contact you again with follow up questions or clarifications?**  YES  NO

**Telephone number of subject:**

\_\_\_\_\_

Maari ba kaming makipag-ugnayan muli sa iyo para sa susunod pang mga katanungan o paglililaw?  OO  HINDI Numero ng telepono: \_\_\_\_\_

The following questionnaire was administered individually to participants by a trained interviewer from the Ministry of Health or Institut Pasteur. The interviewer read each question aloud and recorded the participants answers directly into the questionnaire.

Outbreak Investigation Questionnaire

GENERAL INFORMATION

PANGKALAHATANG IMPORMASYON

1. Subject ID: \_\_\_\_\_

Numero ng ID: \_\_\_\_\_

2. Subject Name: First name \_\_\_\_\_ Surname \_\_\_\_\_

Panglan: \_\_\_\_\_ Apelyido: \_\_\_\_\_

**SECONDARY JOB**

3. Do you hold other jobs aside from your primary job?  YES  NO

3.1. If yes, what is/are your other job(s)? \_\_\_\_\_

3.2. If yes, where is this other job? \_\_\_\_\_

3.3. If yes, how often in the week do you work at this second location?

4. Day Working? Hour start Hour end

Monday  YES \_\_\_\_\_

Tuesday  YES \_\_\_\_\_

Wednesday  YES \_\_\_\_\_

Thursday  YES \_\_\_\_\_

Friday  YES \_\_\_\_\_

Saturday  YES \_\_\_\_\_

Sunday  YES \_\_\_\_\_

**Ikaw ba ay may iba pang trabaho sa ibang lugar maliban sa lokasyon na ito?  Meron  Wala**

Kung oo, ano ang / iyong (mga) iba pang mga trabaho? \_\_\_\_\_

Kung oo, gaano kadalas sa isang linggo ka nagtatrabaho dito sa pangalawang lokasyon?

Araw Nagtatrabaho? Umpisa ng trabaho Tapos ng Trabaho

Lunes  Oo \_\_\_\_\_

Martes  Oo \_\_\_\_\_

Miyerkules  Oo \_\_\_\_\_

Huwebes  Oo \_\_\_\_\_

Biyernes  Oo \_\_\_\_\_

Sabado  Oo \_\_\_\_\_

Linggo  Oo \_\_\_\_\_

**5. If the second location is a health care facility:**

5.1. What is the name of the health care facility in which you work? \_\_\_\_\_

5.2. What is the location of the health care facility in which you work? \_\_\_\_\_

5.3. Where in the health care facility do you work? \_\_\_\_\_

5.4. What/which department(s) in this health care facility do you work?  
\_\_\_\_\_

5.5. Do you have any contact with biological specimens during your work?  Yes  No  
Unknown

5.6. Do you handle soiled patient linens during your work?  Yes  No Unknown

5.7. Have you worked in a room where there was a MERS-CoV patients?  Yes  No  
Unknown

**Kung ang pangalawang lokasyon/trabaho ay isang pasilidad ng pangangalagang pangkalusugan:**

Ano ang pangalan ng pangangalagang pangkalusugan (health care facility) kung saan ka nagtatrabaho: \_\_\_\_\_

Ano ang lokasyon ng pangkalusugang pag-aalaga pasilidad kung saan ka nagtatrabaho  
\_\_\_\_\_

Saan sa mga pasilidad ng pangangalagang pangkalusugan ka nagtatrabaho?  
\_\_\_\_\_

Ano, o sa aling (mga) departamento ng pasilidad na ito sa pangangalaga ng kalusugan ka nagta trabaho? \_\_\_\_\_

Mayroon ka bang anumang mga contact sa mga biological ispesimen sa panahon ng iyong trabaho? \_\_\_\_\_  Meron  Wala  Di Alam

Humahawak ka ba ng maruming gamit ng pasyente tulad ng linens sa panahon ng iyong trabaho?  Oo  Hindi  Di Alam

Ikaw ba ay nakapagtrabaho sa isang silid kung saan nagkaroon ng mga pasyenteng may MERS-CoV?  Oo  Hindi  Di Alam

**6. In the last 6 weeks, have you worked in a health care facility?  Yes  No**

6.1. What is the name of the health care facility in which you worked? \_\_\_\_\_

6.2. What is the location of the health care facility in which you worked?  
\_\_\_\_\_

6.3. Where in the health care facility did you work? \_\_\_\_\_

6.4. What/which department(s) in this health care facility did you work? \_\_\_\_\_

6.5. Did you have any contact with biological specimens during your work?  Yes  No  
 Unknown

6.6. Did you handle soiled patient linens during your work?  Yes  No  Unknown

6.7. Did you work in a room where there was a MERS-CoV patients?  Yes  No  
 Unknown

**Sa huling 6 na linggo, ikaw aba y nagtrabaho sa isang pasilidad ng pangangalaga ng kalusugan?  Oo  Hindi**

Ano ang pangalan ng mga pasilidad ng pangangalagang pangkalusugan sa kung saan ka nagtrabaho? \_\_\_\_\_

Ano ang lokasyon ng mga pasilidad ng pangangalagang pangkalusugan sa kung saan ka nagtrabaho? \_\_\_\_\_

Saan sa mga pasilidad ng pangangalagang pangkalusugan ka nagtatrabaho? \_\_\_\_\_

Ano, o sa aling (mga) departamento ng pasilidad na ito sa pangangalaga ng kalusugan ka nagta trabaho? \_\_\_\_\_

Mayroon ka bang anumang mga contact sa mga biological ispesimen sa panahon ng iyong trabaho? \_\_\_\_\_  Meron  Wala  Di Alam

Humahawak ka ba ng maruming gamit ng pasyente tulad ng linens sa panahon ng iyong trabaho?  Oo  Hindi  Di Alam

Nagtatrabaho ka ba sa isang silid kung saan nagkaroon ng mga pasyente MERS-CoV?

PERSONAL PROTECTIVE EQUIPMENT AND HYGIENE PRACTICES if you also worked in a health care facility in the last 3 months

**7. What personal protective equipment do you usually wear when working at the health care facility?**

- No protective equipment used  Gloves  Coveralls
- Dust masks  Boots or boot covers  Respirators  Eye protection (goggles, safety glasses)  Others: \_\_\_\_\_

**PERSONAL NA KAGAMITANG PANGHARANG AT KALINISAN NA NAKASANAYAN kung ikaw rin ay nagtrabaho sa isang pasilidad ng pangangalagang pangkalusugan sa nakaraang 3 buwan**

**Ano ang personal na proteksiyon kagamitan ay karaniwang mo magsuot kapag nagtatrabaho sa mga pasilidad ng pangangalaga ng kalusugan?**

- Walang kagamitang pangproteksyon na ginamit  Guwantes  Coveralls
- Dust masks  Boots or boot covers  Respirators
- Proteksyon sa mata (goggles)  At Iba pa: \_\_\_\_\_

**8. How often do you usually wash your hands while working at the health care facility (check all)**

- At mealtimes  Before and after each animal related task  At bathroom times
- The beginning and end of the day  Rarely

Gaano kadalas ka kadalasang naghuhugas ng inyong mga kamay habang nagtatrabaho sa iyong pangunahing trabaho (i-check ang lahat)

- sa oras ng kainan  Bago at pagkatapos ng bawat gawain na may kaugnayan sa hayop  
 sa oras ng pagba banyo  Sa pag simula at pagtatapos ng araw  Madalang

Pregnancy

**3. Are you pregnant?**  YES  NO  UNKNOWN

Ikaw ba ay buntis?  OO  HINDI  DI MATUKOY

**4. If no, were you pregnant in the last six months?**  YES  NO  UNKNOWN

Kung Hindi, ikaw ba ay buntis sa huling anim na buwan?  OO  HINDI  DI MATUKOY