



An Investigation of a Coronavirus Disease (COVID-19) Cluster from Saudi Arabia, in a State Quarantine, Chonburi, Thailand, 2020

Thananan Jivaramonaikul^{1*}, Natthaprang Nittayasoot¹, Rapeepong Suphanchaimat^{1,2}

1 Division of Epidemiology, Department of Disease Control, Ministry of Public Health, Thailand

2 International Health Policy Program, Ministry of Public Health, Thailand

*Corresponding author email: thananan.nijjak@gmail.com

Abstract

On 7 Aug 2020, the Department of Disease Control, the Thai Ministry of Public Health, was notified of 14 COVID-19 cases from Saudi Arabia. The objectives of this study were to verify diagnosis, describe characteristics of the cases and identify possible causes of infection. A cross-sectional descriptive study was conducted by reviewing the cases' medical records, interviewing the cases and state quarantine staff, and surveying the environment. A confirmed COVID-19 case was defined as a passenger in a flight from Saudi Arabia on 25 Jul 2020 with positive RT-PCR. Out of 219, 14 were infected with SARS-CoV-2. Most of them were Thai students in Saudi Arabia. The median age of cases was 26 years and male to female ratio was 13:1. The median RT-PCR cycle thresholds for ORF1ab and N genes were 36 and 35. The state quarantine process mainly followed the national guidelines. These cases were likely to have contracted COVID-19 from Saudi Arabia. The risks of infection in Saudi Arabia included living together in the same dormitory and visiting crowded areas. The introduction of state quarantine and COVID-19 testing worked well in preventing new cases. The government should communicate with people planning to travel about the importance of physical distancing and avoiding any risk behaviors while being abroad.

Keywords: COVID-19, state quarantine, Thailand, Saudi Arabia

Introduction

On 22 Aug 2020, the World Health Organization reported almost 23 million confirmed cases of coronavirus disease 2019 (COVID-19) including approximately 800,000 deaths.¹ In Saudi Arabia, the COVID-19 situation was alarming as there were 305,186 confirmed cases and 3,580 deaths since the start of the pandemic in March 2020.² At time of writing, the number of total COVID-19 cases who departed from Saudi Arabia to visit Thailand was 43 (excluding the cases identified in this outbreak). Since March 2020, Saudi Arabia exercised a lockdown policy and a mandatory mask wearing policy in public areas.³

Since Thailand faced a cluster of COVID-19 in March 2020, a travel restriction policy was exercised. The number of daily cases started to subside in May 2020. The Thai government later relaxed its travel policies by allowing travelers and Thai returnees from abroad to enter the country. All inbound travelers are obliged to stay in a quarantine center (so-called, state quarantine [SQ]) for 14 days. Real-time polymerase chain reaction

(RT-PCR) testing is done to detect SARS-CoV-2 twice while staying in the quarantine center (first test on day 3–5 and second test on day 11–13).^{4,6} Cases with a positive result are referred to a designated hospital for further treatment.⁷ International travelers need to have evidence of negative RT-PCR 72 hours before leaving (COVID-19 Free Certificate [CFC]) the country of departure. For Thai returnees, the requirement for getting on board is only a possession of Fit-to-Fly certificate, which requires only medical examination whereas CFC is optional.

On 7 Aug 2020, the COVID-19 Operation Team of the Department of Disease Control (DDC), the Thai Ministry of Public Health (MOPH), received a notification from the Office of Disease Prevention and Control Region 6 Chonburi (OPDC-6), that there was a cluster of confirmed COVID-19 patients (n=14) travelling from Saudi Arabia. These patients showed positive test results while staying in a quarantine center in Pattaya City (for convenience, we referred this to SQ-X). Therefore, the objectives of this study were to verify diagnosis, describe characteristics of the

cases, identify possible causes of infection and provide recommendations for prevention and control.

Methods

We applied a descriptive cross-sectional study. Data collections consisted of in-depth interviews with the cases and SQ staff, reviewing medical records and flight history, and environmental survey on the SQ. The patients were asked about risk behaviors in Saudi Arabia and their travel history.

We performed contact tracing on travelers on the flight and in SQ, using 'Guideline for surveillance and case investigation for coronavirus disease 2019 (COVID-19)' version 15 May 2020, by the DDC.⁷ We defined a confirmed case as a passenger on the same flight (EK0384, 25 Jul 2020) in the SQ that showed positive test for SARS-CoV-2 by RT-PCR during 25 Jul to 8 Aug 2020. A close contact was defined as any person interacting with a confirmed case of COVID-19 within a one-meter distance for at least five minutes, or being coughed or sneezed on, or being in an enclosed space without proper ventilation with a confirmed case for at least 15 minutes. A close contact was further categorized as high risk (without adequate personal protective equipment [PPE]) and low risk (with adequate PPE).

For the environmental study, we interviewed physicians at the SQ, the hotel manager, SQ commander, and infectious control nurse about the

infection control processes. An environmental survey at the SQ was done by non-participant observation using 'Guidance for integrated management of state quarantine facilities' by the MOPH.⁶

Results

Descriptive Characteristics of the Cases

On 25 Jul 2020, there were 219 passengers on the flight. There were 199 passengers from Saudi Arabia; the rest were from Lebanon. Fourteen passengers from Saudi Arabia showed positive result for SARS-CoV-2 by RT-PCR while 20 passengers from Lebanon were tested negative. Only one case showed mild symptoms (having phlegm); and the other 13 cases were asymptomatic. All of them were Muslims. The overall attack rate from the flight was 6.4% (14/219). The attack rate among passengers from Saudi Arabia was 7.0% (14/199) and the median age of the cases was 26 years (Q1=24.25, Q3=26.75). Twelve out of all fourteen cases (85.7%) were students; the others were a religion volunteer and a housewife. All of them were Thai. About one fifth of the Islamic students were confirmed cases (12/56; 21.4%). Of these 219 passengers, 106 were taken to SQ-X. The attack rate among those staying in SQ-X was 13.2% (14/106). All confirmed cases were sent to nearby hospital to receive treatment for 14 days from date of sample collection. Brief characteristics of the cases and laboratory results are presented in Table 1.

Table 1. Brief characteristics and results of RT-PCR testing of COVID-19 cases

No.	Gender	Age (years)	Occupation	Symptoms	Positive for SARS-CoV-2 on June 2020	Sample collection date	RT-PCR Ct*	
							ORF1ab	N gene
1	Male	24	Student	No	Yes	28 Jul 2020	37.96	37.56
2	Male	24	Student	No	Yes	28 Jul 2020	36.78	37.04
3	Male	28	Student	No	-	5 Aug 2020	35.24	34.26
4	Male	24	Student	No	-	5 Aug 2020	36.85	36.00
5	Male	24	Student	No	-	5 Aug 2020	36.41	35.05
6	Male	25	Student	No	-	5 Aug 2020	33.97	34.82
7	Male	25	Student	Yes	-	5 Aug 2020	36.22	35.36
8	Male	25	Student	No	-	5 Aug 2020	34.53	35.60
9	Male	26	Student	No	-	5 Aug 2020	36.25	35.00
10	Male	27	Student	No	Yes	5 Aug 2020	37.65	35.58
11	Female	50	Housewife	No	-	5 Aug 2020	37.50	38.69
12	Male	43	Religion volunteer	No	-	5 Aug 2020	33.57	33.48
13	Male	26	Student	No	-	7 Aug 2020	38.86	37.07
14	Male	26	Student	No	-	7 Aug 2020	34.81	33.80

*Cycle threshold

Laboratory Results

Three days prior to departure from Saudi Arabia, all of them undertook a RT-PCR test according to the regulation of the Minister of Foreign Affairs. The results showed negative before departure. Upon their stay in SQ-X, all 106 passengers were tested and two of them presented with positive SARS-CoV-2 detection on the first round of testing (on 28 Jul 2020; day 3 after arrival). The SQ officers performed nasopharyngeal swab again on 104 passengers on 5 Aug 2020 (Day 11 after arrival) and ten were found positive for SARS-CoV-2. On 7 Aug 2020 (Day 13 after arrival), the other two passengers, showing inconclusive results in the second test, were tested again and showed positive results. The median cycle threshold (Ct) of RT-PCR for ORF1ab and N genes were 36.33 (Q1=34.92, Q3=37.34) and 35.47 (Q1=34.87, Q3=36.78) respectively (Table 1).

Risk History

During March to May 2020, Saudi Arabia imposed city lockdown and curfew. Universities were closed and students were screened for SARS-CoV-2. Five students on this flight were found positive for SARS-CoV-2 by RT-PCR and were isolated in university dormitory. Three students who were cases in this event informed that they had taken a RT-PCR test for COVID-19 in June 2020 with positive results. At that time, they were not admitted to a hospital, but were advised to self-quarantine for 14 days, in which they still shared room, kitchen and toilet with the other students.

All of the cases informed that, while being in Saudi Arabia, they went to a department store twice a week.

Four of them visited a mosque two weeks before travelling. All of the students lived in the same dormitory affiliated to the Islamic University in Saudi Arabia. The dormitory had ten rooms and shared two toilets on each floor, and a shared kitchen on the first floor. They mentioned that they did not perform frequent hand washing and did not wear a mask all the time. They rarely practiced physical distancing when staying in their private rooms as 2–4 people were living together in the same room. The room was air-conditioned.

On 24 Jul 2020, 56 students took a public bus while the others (religious volunteer and housewife) took a taxi to the airport. On 25 Jul 2020, they took a flight from Saudi Arabia that took two hours and had a transit in United Arab Emirates, then arrived in Thailand by another flight that took six hours with a meal served on the flight. On both flights, all passengers wore a mask all the time on the plane except during meal time. The patients mentioned that the seat positions on the flight were randomly assigned. There was no specific cluster of the flight seats related to the cases. The flight's seat plan of 196 passengers is presented in Figure 1. There were three infants that sat on mothers' lap and 20 tested-negative passengers did not declare their seat numbers. All cabin crew wore a mask during service and wore gloves while serving the meals. There was no distancing at the airport during the immigration process and while waiting for the luggage. The bus provided by the Department of Land Transport took them to SQ-X. On the bus, all passengers and the driver wore a mask and practiced physical distancing.

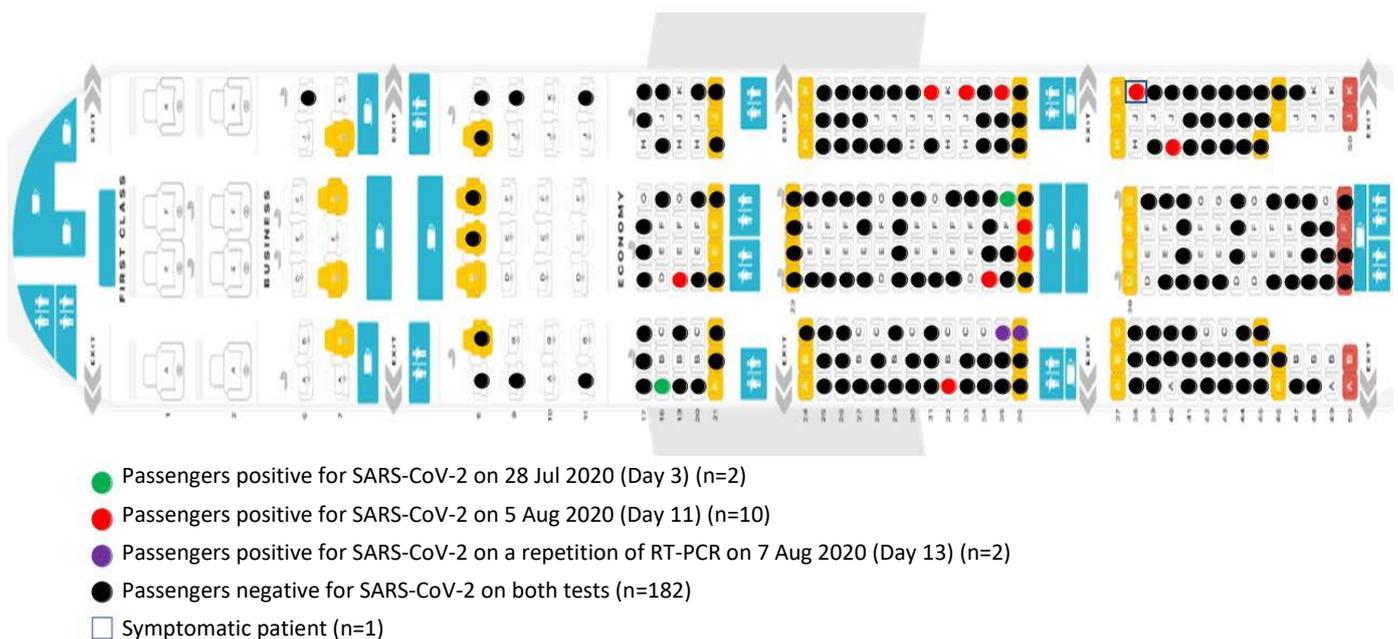


Figure 1. Flight's seat plan by EK0384 from United Arab Emirate to Thailand on 25 Jul 2020

Environmental Survey

The SQ-X composed of three buildings with a total of 360 rooms. It was jointly managed by the Royal Thai Army and the Office of Disease Prevention and Control Region 6 Chonburi, and Chonburi Provincial Health Office. Upon arrival at the SQ, the name of the passengers and bus numbers were recorded by hotel staff. The passengers' luggage was initially cleaned at the airport. There were no luggage or shoe cleaning areas at the SQ. All passengers had to carry their own luggage to the room. A registration area was placed in front of the hotel building and was separated from the staff operation area. Hotel staff were responsible for registration and were required to wear gloves and face mask all the time. Guests always wore a face mask. There was a specific elevator for guests, separated from the staff. Trash removal was done in the elevator for staff. Each guest individual was assigned a single room, except for children under 12 years or disabled people. No one was allowed to leave the room without permission except for taking food. The food was served at the entrance to each room. Guests were able to leave the SQ once completing a 14-day stay, and only if the RT-PCR results showed negative for all rounds. Staff monitored the guests' behavior by closed-circuit television. When any guest left the room without permission, the hotel staff would warn them using loudspeaker. If anyone showed positive results for SARS-CoV-2, they would be recognized as a patient and referred to the designated public hospital.

Discussion

All of the confirmed cases in this event had a history of staying in Saudi Arabia. During the investigation period, Saudi Arabia was one of the countries which severely suffered from the COVID-19 pandemic at that time.² The potential risk of contracting SARS-CoV-2 in Saudi Arabia was the behavior of students in the university dormitory.⁸ All students always shared kitchens and bathrooms with each other even after some students were positive for SARS-CoV-2. Based on the interviews, the preventive behaviors in the dormitory were quite relaxed. Other risk factors included the use of public transport and visiting crowded areas (such as department store or mosque).⁹ This finding coincided with the report of prior literature that revealed COVID-19 outbreaks in venues for religious activities.¹⁰

Laboratory results also provided evidence to determine the timing of disease transmission. The Ct times of RT-PCR testing on both ORF1ab and N genes were more than 32 in all cases.¹¹ The median Ct times of ORF1ab and N genes were quite high. A high value of Ct time indicates that the infection is not recent.

A study by Bullard et al found that the Ct time of the positive test after ten days of onset was more than 30 and had less infectivity.¹² Therefore, the likelihood of contracting the disease before arrival to Thailand was higher than being infected within Thailand.

The risk of transmission happened even though the patients were asymptomatic or pre-symptomatic.¹³ This means that although almost all cases were asymptomatic, the risk of disease transmission among each other could not be ruled out. There was also a risk of transmission on the plane as the seats were almost all occupied, making it difficult to practice physical distancing. Although in this event, it is not conclusive that the cases contracted COVID-19 on the plane, the risk of infection on board is worth considering as there are studies that point to the risk of SARS-CoV-2 transmission on flights.^{14,15}

On the way to state quarantine, the passengers practiced physical distancing measures. Every passenger wore a mask at all times. Thus, the risk of infection on the way to the SQ was low. There had been no local cases in Thailand since May 2020.¹⁶ This state quarantine was evaluated on June 2020 and it appeared that SQ-X well met the SQ standards. From our observation of SQ-X and the interviews with the SQ officers, there were no incidences resulting from contact among the guests. The control measures at the SQ mainly met the standards stipulated by the Guidance for Integrated Management of State Quarantine Facilities of the MOPH.⁶ The internal report of DDC (as of 25 Sep 2020) showed no incidence of infection among guests in the SQ.¹⁷ However, there were some pitfalls regarding the hygiene in the SQ that might aggravate infection risk. For instance, the SQ did not provide specific cleaning areas for shoes and luggage from the airport. In addition, the process of trash removal used the same elevator as staff. This might increase the risk of disease spreading via direct contact.^{18,19}

Limitations

This study faces some limitations. Firstly, the source of infection is not definitely explained as we did not have strong evidence (such as whole genome data) to prove that all cases were infected with the same clade of SARS-CoV-2. Secondly, memory bias might persist as some activities happened long before the diagnosis. We minimized this bias by triangulating the interview data from various sources. Thirdly, the lack of data about patients at the same university as the cases was considered another limitation. Fourthly, we also lacked data about the flight from Saudi Arabia to United Arab Emirates before transit. However, we interviewed the patients, and they informed us that

the behaviors of cabin crew on both flights were similar. Fifthly, the state quarantine management during the environmental survey might be different from its daily practice. Lastly, we lacked the information about the Ct cut-off value for RT-PCR in the Saudi Arabia.

Public Health Actions and Recommendations

State quarantine prevented new cases from emerging in Thailand. Routine evaluation of the SQ management should be conducted to minimize the risk of infection in the SQ. Passengers who need to travel to Thailand, especially those from countries with currently active COVID-19, should avoid going to crowded areas, keep physical distancing and refrain from any risk behaviors (such as sharing kitchenware and not wearing masks while in public spaces). The Thai government should communicate with Thai citizens abroad and emphasize the importance of risk-minimizing behaviors (such as mask wearing and physical distancing) all the time, from being abroad, on the flight, and upon arrival in. Further studies on the correlation of laboratory results (Ct time) and time of contracting the disease are recommended. Data sharing between the airline and the investigation officers should be more timely and more comprehensive than at present.

Conclusion

Of 219 passengers travelling from Saudi Arabia, 14 tested positive for SARS-CoV-2. The overall attack rate among flight passengers was 6%. Only one patient showed mild symptoms; the others were asymptomatic. The majority of cases were male. The infection was most likely to have occurred when they were in Saudi Arabia as the cases had many risk behaviors, such as visiting crowded areas and sharing the same room in the dormitory. The risk of infection in Thailand was low because they were quarantined in the SQ with strict quarantining policies, though there were some minor pitfalls of the control measures in the SQ identified by the environmental survey. Maintaining the standards of SARS-CoV-2 preventive measures in the SQ with regular monitoring and evaluation is recommended. In addition, The Thai government should find ways to communicate with Thai people to emphasize the importance of mask wearing and practicing good social distancing when living abroad.

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