



Contact Tracing and Awareness-Raising Measures for Travelers Arriving in Thailand from High Risk Areas of Coronavirus Disease (COVID-19): A Cluster of Imported COVID-19 Cases from Italy, March 2020

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Abstract

Coronavirus Disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. Since before a global pandemic was declared by the World Health Organization, many countries have been implementing stringent screening protocols on international travelers. In Thailand, a 'Health Beware Card' (HBC) was provided to all travelers at ports of entry. On 5 Mar 2020, the Department of Disease Control (DDC) of the Thai Ministry of Public Health received a notification that there was a COVID-19 confirmed case who traveled from Lombardy, Italy. A joint investigation team commenced an investigation to describe epidemiological characteristics, and identify contacts and possible source cases. Totally three confirmed cases of COVID-19 and one asymptomatic infection were identified in this investigation. The index case was a 41-year-old Thai male. He notified local health providers immediately after the onset of symptoms as per HBC recommendations. Contact tracing led to the identification of three additional cases: two were peers who traveled together with the index case to Italy and one was a close friend. The attack rate among people visiting Italy in this cluster was 50%. Contact tracing was a key control measure to stop the spread of COVID-19, and awareness-raising measures limited local transmission from imported cases. For people traveling from a disease-infected zone, mandatory quarantine and laboratory screening must be enforced.

Keywords: Coronavirus Disease, COVID-19, travelers, contact tracing

Introduction

On 31 Dec 2019, the Chinese Center for Disease Control and Prevention notified the World Health Organization (WHO) about clusters of pneumonia cases with unknown source in Wuhan, Hubei.¹ The disease was later identified as a Novel Coronavirus, and officially named as coronavirus disease (COVID-19) caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2).^{2,3} Afterwards, the infection from China had been imported to many countries, including Thailand.⁴ Thus, on 3 Jan 2020, the Department of Disease Control (DDC) under the Ministry of Public Health, Thailand, initiated screening measures for COVID-19 infection among travelers in all direct flights coming from Wuhan,

China. These measures were expanded to all flights from other high-risk areas on 28 Feb 2020 and later to all international travelers, regardless of countries of origin.⁵⁻⁷

Surveillance measures at all international airports were carried out by screening of body temperature with thermoscan cameras. Health beware card (HBC) and health advices were provided to all travelers at the airports by health control officers, since 3 Jan 2020. The HBC included information about early isolation, detection and self-declaration when seeking care at health facilities (Figure 1).

During February and March 2020, COVID-19 was spreading throughout Europe, and Italy was one of the worst affected countries in the region.⁸ The



Figure 1. Health Beware Card (HBC) provided to international travelers by the Department of Disease Control, Ministry of Public Health, Thailand, 2020

number of COVID-19 cases in Italy rose rapidly, reaching 4,500 cases within a few weeks after the first cases were notified in mid-February 2020.⁹ The most affected areas were Lombardy and Veneto Regions in the northern Italy.^{10,11} In Thailand, approximately, as of early March 2020, there were about 40 confirmed cases. The majority of the cases were travelers from China and Thai citizens who had a history of contact with the infected travelers. At that time, there had not been a report of imported cases from Europe or any other regions aside from Asia.

On 5 Mar 2020 in Thailand, the DDC received notification, from Office of Disease Prevention and Control 6, of a confirmed COVID-19 case who had traveled from Lombardy Region in Italy to his home in Chonburi Province. Thus, a joint investigation team comprised of DDC epidemiologists and local health staffs conducted an investigation during 5 to 10 Mar 2020 to describe clinical and epidemiological characteristics of COVID-19 case(s), identify contacts and possible source cases, and provide recommendations for effective disease control.

Methods

Descriptive Study

A descriptive study was conducted from 5 to 10 Mar 2020. Following the national guideline on investigation of COVID-19, a confirmed case was defined as a patient under investigation (PUI) who had tested positive for genetic materials of SARS-CoV-2 by PCR from two reference laboratories, or by

viral genetic sequencing technique or culture. All persons who had contact with the index case after onset of symptoms were identified.¹² Contacts were divided into two main categories: high and low risk. A high-risk contact was a person: (i) who had physical contact or talked with the index case within a 1-meter distance for more than 5 minutes, or (ii) who lived together or stayed with the index case within a 1-meter distance in a confined setting, or (iii) who was a health care worker (HCW) attending to the index case and did not wear adequate personal protective equipment (PPE).¹³ A low-risk contact was a person: (i) who was a HCW attending to the index case with adequate PPE, or (ii) who traveled in the same vehicle with the index case for a short period of time and did not fulfill the criteria of a high-risk contact (Figure 2). A possible source case was a contact that had fever or upper respiratory tract symptoms within two weeks prior to the index case's symptom onset.

A semi-structured questionnaire was used to interview with the index case. Demographic characteristics, present and past illnesses, risk factors, possible source cases and contacts were collected. All contacts of the cases were also interviewed to obtain information on demographic characteristics, underlying diseases, and clinical symptoms. Medical records of the index case and contacts were reviewed.

Laboratory Investigation

Throat and nasopharyngeal swabs were collected from all high-risk contacts on the fifth day after

contact with a confirmed case. The specimens were sent to two laboratory centers: the National Institute of Health (NIH) and the Thai Red Cross Emerging Infectious Disease Health Science Centre (TRC-EID). Both laboratories used reverse transcription polymerase chain reaction (RT-PCR) to identify SARS-CoV-2 as per the WHO protocol.¹⁴

Ethical Considerations

Ethical clearance was not required since this study was part of the routine outbreak investigation of the

national response to infectious diseases.

Results

Upon investigation and contact tracing, total three confirmed cases of COVID-19 and one asymptomatic infection were identified in this investigation, including the index case and his three close contacts (Mr. C, Mr. D and Ms. F). The majority of cases (3/4: 75%) had a history of visiting the northern Italy. The attack rate among people who traveled to Italy was 50% (3/6).

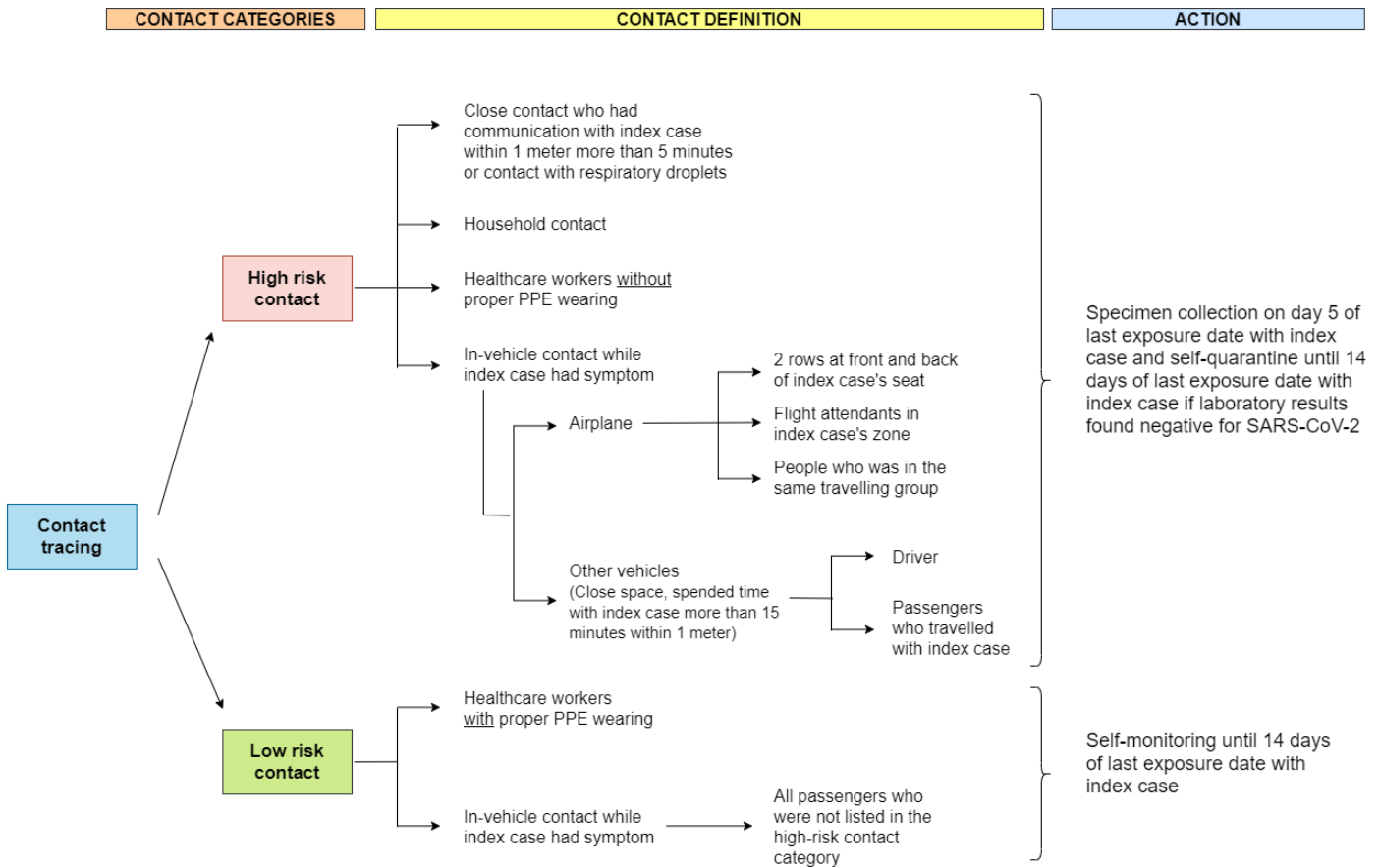


Figure 2. Categories of contacts, contact definition and actions taken for on different categories of contacts

Description on the Index Case

The index case was a 41-year-old Thai male, and worked as a project manager at a construction site in Sriracha District, Chonburi Province, Thailand. He and two colleagues (Mr. A and Mr. B) visited Lombardy Region in the northern Italy from 22 Feb to 2 Mar 2020 for business. During his stay in Italy, on 28 Feb 2020, he developed myalgia, yet no fever or respiratory symptoms. He did not seek treatment in Italy. Upon his arrival at Suvarnabhumi Airport in Bangkok, Thailand, he could pass through the thermoscan screening. However, he was in self-quarantine at his apartment as recommended by the HBC that he received upon arrival.¹⁵ On 3 Mar 2020,

since he had a low-grade fever and sore throat, he visited a nearby private hospital, and also reported his travel history. He was directly sent to the acute respiratory infection (ARI) clinic in that hospital. His body temperature was 37.8 °C and respiratory rate was 20 per minute without any signs of shortness of breath or dyspnea. According to the national guideline, he was classified as a ‘patient under investigation’ (PUI) for COVID-19, and throat and nasopharyngeal swabs were collected at the ARI clinic. Both of his specimens were sent to two laboratories, NIH and TRC-EID, and later showed positive for SARS-CoV-2, identifying him as the first imported case of COVID-19 in Thailand.

Travel History in Italy

On 22 Feb 2020, the index case, Mr. A and Mr. B arrived at Milan in Lombardy Region. He did not notice anyone presenting with upper respiratory tract symptoms on the flight to Italy. On 23 Feb 2020, he

met other three Thai colleagues (Mr. C, D and E) who arrived at Italy since 18 Feb 2020. Mr. C, Mr. D and Mr. E had travelled to Piacenza, which is located about 70 kilometers from Milan, by a private van on 19 to 21 Feb 2020 (Figure 3).

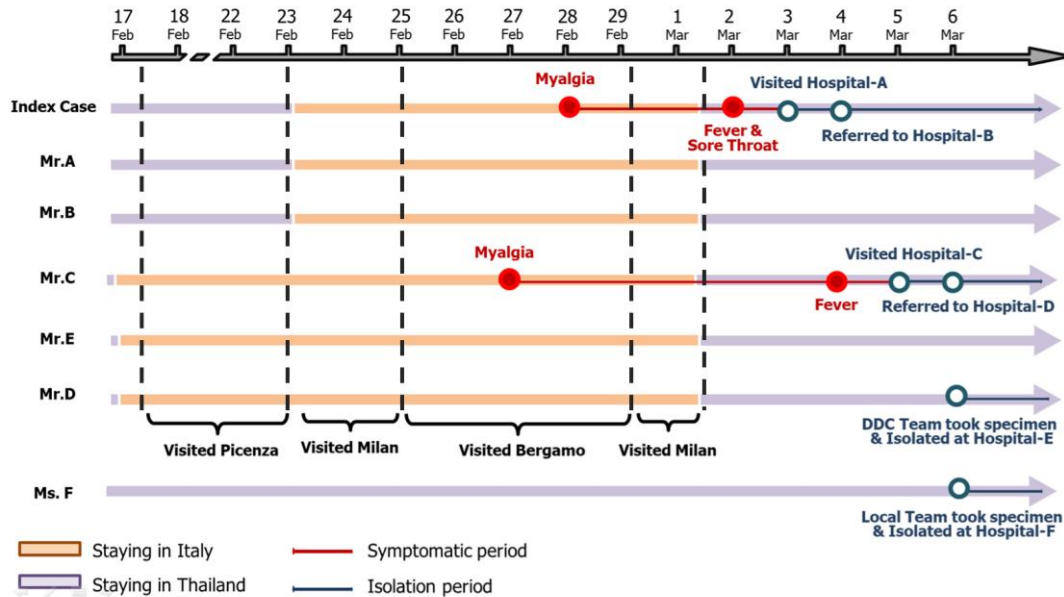


Figure 3. Timeline of Thai people (Mr. A, B, C, D and E) who travelled in Italy with the index case and one additional close contact (Ms. F)

On 23 Feb 2020, the index case, Mr. A and Mr. B took a sightseeing tour in Milan. On 24 Feb 2020, all six of them visited a factory in Milan. A few local staff guided them to visit the factory. No employees in that factory seemed to have signs of illness during their visit. On 25 to 29 Feb 2020, they all traveled to Bergamo in Lombardy Region, which is about 70 kilometers from Milan and was identified as a high-risk area of COVID-19 by the Ministry of Health, Italy.

Throughout their stay in Italy, they traveled with a local driver in a private van provided by the company. The index case usually sat next to Mr. C and Mr. D at the rear of the van. All of them stayed in a single room each. They reported that they did not visit any crowded places, use public transportation during rush hours, or have close contact to any local people with upper respiratory tract symptoms in Italy. They also reported that most of the local people did not wear face masks.

Contact Tracing

On the flight from Italy to Thailand, with transit in Dubai, there were approximately 500 passengers onboard. The investigation team attempted to contact

high-risk passengers (n=60, seating within a 2-row distance from the index case) and onboard staff. On 6 Mar 2020 (one day after notification), we notified the airline company about the index case. However, due to administrative limitations, contact information on high-risk passengers and aircrew was not obtained and could not be traced back. In addition, four airport officials working at Suvarnabhumi Airport were screened. All of them tested negative for SARS-CoV-2 (Figure 4).

One close contact during self-quarantine was identified since the index case met Ms. F at his apartment for souvenir giving for about two hours on 2 Mar 2020. Both of them wore masks during the meeting. During that time, the index case felt like he had a low-grade fever, and thus, Ms. F gave her water bottle and some medicines to him. However, Ms. F could not remember whether she had used the water bottle again.

In the private hospital that the index case visited on 3 Mar 2020, 12 close contacts were identified who were HCWs at the screening area and the ARI clinic, and categorized as high-risk contacts. On 4 Mar 2020, he was referred to a public hospital where no high-risk contacts were identified.

Throughout the investigation, out of total 550 contacts (including passengers on the same flights), 76 (13.8%) of them were identified as high risk. However, only 48 (8.7%) out of 550 contacts could be traced. All of uncontactable groups were passengers and airline staff on the same flights of the index case and the taxi drivers. Of these 48 contacts, 23 (48%) were identified as high risk, and nasopharyngeal swabs were collected (Table 1).

Of 23 contacts tested, Mr. C, Mr. D and Ms. F were found to have SARS-CoV-2. The attack rate (AR) among all contactable high-risk contact and all contact were 13% (3/23) and 6% (3/48). Interestingly, the AR among the index case's contacts who traveled to Italy was 40% (2/5). Most of the cases in this study (3/4) had only mild symptoms and only one of them was asymptomatic (Table 2).

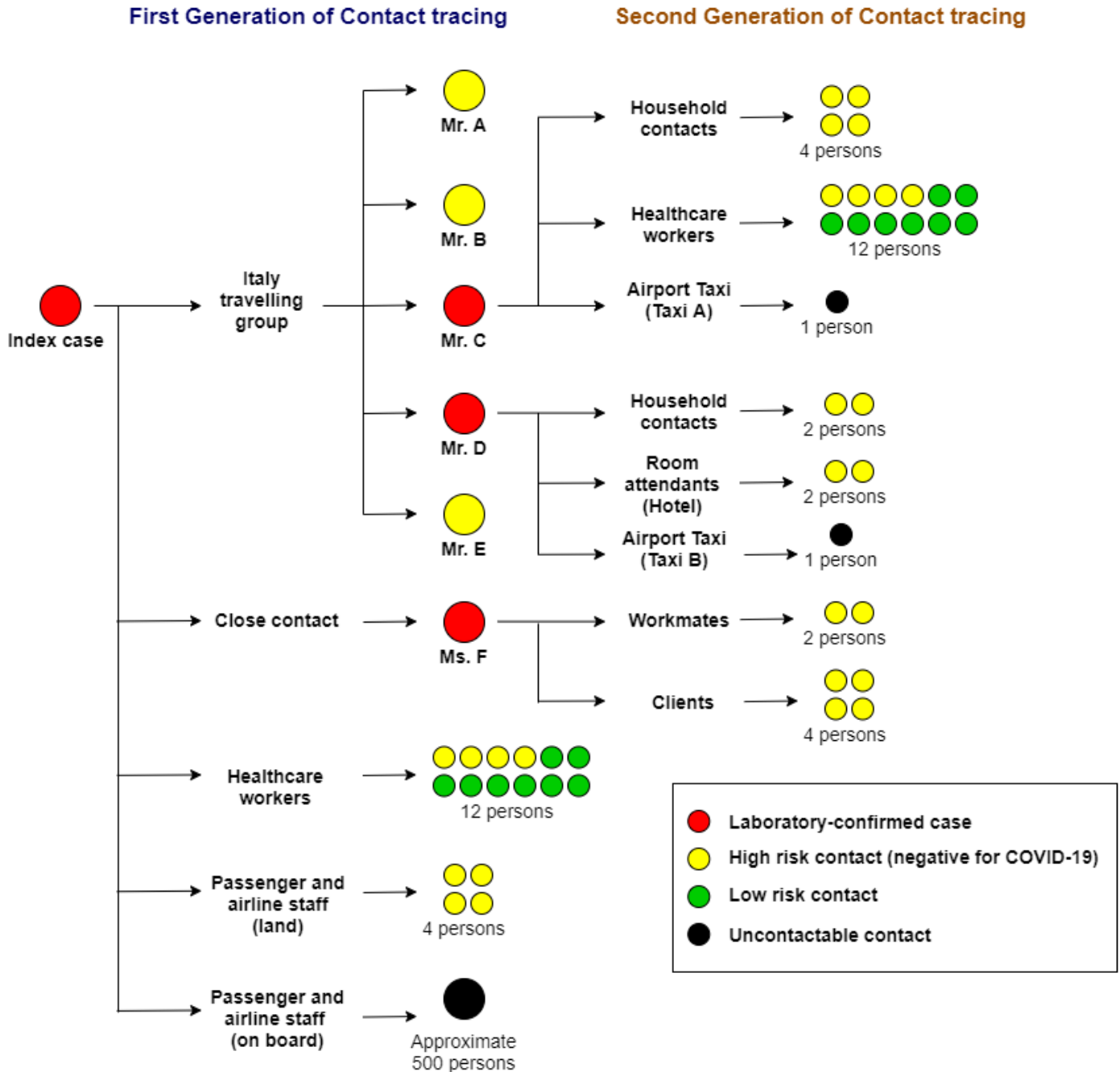


Figure 4. Generation tree of contacts

Mr. C reported that he had myalgia since 27 Feb 2020. Upon his arrival in Thailand, he stayed with his wife and three children. He reported that he strictly isolated himself in his room and wore a face mask almost all the time. On 4 Mar 2020, he developed

fever without any respiratory symptoms. On the following day, he visited another private hospital. Twelve HCWs were identified as close contacts, and four out of twelve were labeled as high-risk since they wore only face masks when taking care of Mr. C. On

the following day, after testing positive for SARS-CoV-2, he was referred to another public hospital where no additional high-risk contacts were found.

Mr. D, after arriving home, had a short talk with his wife and his nephew for about 10 minutes. All of them wore a face mask. Then he drove to a hotel to quarantine himself. Two hotel staff members were identified as high-risk contacts. After he learned about the index case, he visited a screening unit of

the DDC, and provided a specimen for testing. He was admitted in a public hospital after testing positive for SARS-CoV-2.

Ms. F, after meeting with the index case, travelled to her hometown in another province. On 5 Mar 2020, she met with two colleagues and four clients. She reported that she always wore face mask when she met other people. All of them were identified as high-risk contacts and had tested negative for SARS-CoV-2.

Table 1. Type, total number, proportion of high-risk contacts and corresponded attack rate

| Case | Type of contact | Total contact | High-risk contact (% of total contact) | Identifiable contact (% of total contact) | Identifiable (% of high-risk contact) | Confirmed Case | Attack rate* |
|------------|----------------------------|---------------|--|---|---------------------------------------|----------------|--------------|
| Index case | Colleague | 5 | 5 (100%) | 5 (100%) | 5 (100%) | 2 | 40% |
| | Airplane (Milan - Dubai) | ~250 | ~25 (10%) | 0 (0%) | 0 (0%) | - | - |
| | Airplane (Dubai-Bangkok) | ~250 | ~25 (10%) | 0 (0%) | 0 (0%) | - | - |
| | Airport Staff (Land staff) | 4 | 2 (50%) | 4 (100%) | 2 (100%) | 0 | 0 |
| | Friend | 1 | 1 (100%) | 1 (100%) | 1 (100%) | 1 | 100% |
| | Hospital-A | 12 | 3 (25%) | 12 (100%) | 3 (100%) | 0 | 0% |
| | Hospital-B | 0 | - | - | - | - | - |
| Mr. C | Family | 4 | 4 (100%) | 4 (100%) | 4 (100%) | 0 | 0% |
| | Hospital-C | 12 | 4 (33%) | 12 (100%) | 4 (100%) | 0 | 0% |
| | Hospital-D | 0 | - | - | - | - | - |
| | Taxi-A | 1 | 1 (100%) | 0 (0%) | 0 (0%) | - | - |
| Mr. D | Family | 2 | 2 (100%) | 2 (100%) | 2 (100%) | 0 | 0% |
| | Hotel staff | 2 | 2 (100%) | 2 (100%) | 2 (100%) | 0 | 0% |
| | Taxi-B | 1 | - | 0 (0%) | 0 (0%) | - | - |
| Ms. F | Workmate | 2 | 2 (100%) | 2 (100%) | 2 (100%) | 0 | 0% |
| | Client | 4 | 4 (100%) | 4 (100%) | 4 (100%) | 0 | 0% |
| Total | | 550 | 76 (13.8%) | 48 (8.7%) | 23 (30.2%) | 3 | 6.3% |

Note: * Attack rate among total contacts

Discussion

We identified total four confirmed cases of COVID-19 in March 2020 since the emergence of the novel infection and pandemic. The index case was the first confirmed case in Thailand which imported from Italy. Three additional cases were confirmed, including two cases who traveled together with the index case in

Italy and one case who was likely to be infected by the index case in Thailand.

Three out of four confirmed cases had a history of visiting the northern Italy. During that time, Lombardy Region was identified as a high-risk area of SARS-CoV-2 infection. Despite that, the index case reported that few people wore face masks in public

places. In addition, the index case and Mr. C developed symptoms after five days they arrived in Italy. This is consistent with the estimated incubation period of COVID-19.¹⁶ Therefore, it was likely that the index case and his colleagues had contracted SARS-CoV-2 in the Lombardy Region of Italy.

Evidence suggests that SARS-CoV-2 virus can be spread from an asymptomatic case or a patient with mild symptoms, which is known as the 'pre-

symptomatic'.^{17,18} It was inconclusive if Mr. C and Mr. D were infected from his colleague or from the same common source. For Ms. F, even though she spent only two hours with the index case and wore a mask during the meeting, she was still infected. A possible route of transmission could have been through an indirect contact from an infected surface, such as the bottle of water or the Italian souvenirs. Evidence suggests that SARS-CoV-2 can survive up to four hours on copper, up to 24 hours on cardboard and up

Table 2. Characteristics of laboratory-confirmed COVID-19 cases (n=4)

| Name | Age | Gender | Underlying disease | Onset of symptom | Symptom | Severity | Treatment |
|-------|-----|--------|--------------------|------------------|-----------------------------|--------------|--|
| Index | 41 | Male | - | 28 Feb 2020 | Myalgia, Fever, Sore Throat | Mild | Oseltamivir, Chloroquine and Lopinavir/Ritonavir |
| Mr. C | 40 | Male | Dyslipidemia | 27 Feb 2020 | Myalgia, Fever | Mild | Supportive; no antimicrobial/anti-viral medicine |
| Mr. D | 39 | Male | - | 6 Mar 2020 | Cough, Dry throat | Mild | Supportive; no antimicrobial/anti-viral medicine |
| Ms. F | 41 | Female | - | - | Asymptomatic | Asymptomatic | Supportive; no antimicrobial/anti-viral medicine |

to two to three days on plastic and stainless steel.^{19,20} In addition, a face mask alone might not be able to perfectly protect a person against direct transmission of the virus unless other hygienic behaviors (for example, social distancing) are exercised in parallel.

This study highlighted the merits of the HBC and how it can serve as a complementary measure, along with the thermoscan, to raise awareness among travelers. The information on HBC not only helps raising awareness among travelers, but also facilitates early detection of potential cases and subsequent outbreak investigations.

The HBC also enables HCWs to recognize the risk of infection from care-seeking patients, which can lead to appropriate use of PPE.^{15,21,22} To avoid transmission to HCWs, a systematic management of confirmed cases and persons suspected with COVID-19 needs to be in place. This includes a proper triage system, adequate and appropriate PPE for frontline workers, and a well-rehearsed practice of transferring cases from private hospitals to public hospitals with appropriate isolation facilities. All of these activities need seamless cooperation between the central authorities, such as the DDC, and health facilities.²³

Contact tracing is an important public health response to control COVID-19.^{24,25} We identified three more infected cases from the index case, and all of them were colleagues and close contacts. This finding suggested public health authorities to pay attention on contact tracing, regardless of the symptoms of cases or contacts.²⁶ This study found zero transmission among family contacts. This finding was attributed to cooperation of cases following HBC recommendations, and family members who supported the cases' self-quarantine to mitigate the spread of transmission.²⁷

This study had some limitations. Firstly, the investigation team could not identify about 62 high-risk contacts, including two taxi drivers, and passengers and aircrew on the flight from Milan to Dubai and Dubai to Bangkok due to difficulty in obtaining the list of passengers from the airline. This might miss an opportunity to detect other potential cases who could cause further disease spreading. However, the team recommended the airline to inform their staff and passengers about an infected case on those flights. Secondly, some interviewees might not fully disclose their travel or medical history

due to a fear of being stigmatized. However, the team highlighted that the interviews were performed for the sake of outbreak control and all the information obtained were confidential. Thirdly, information bias on travel was inevitable. However, this bias might be limited as the period of exposure to disease onset was within two weeks.

Public Health Recommendations

Firstly, contact tracing measures must be strengthened to halt further transmission of the disease. Though in theory, the 2015 Disease Communication Act ratifies authoritative power for disease control officers to obtain access to the passenger list from the airline, in practice there are some operational constraints. To tackle this, supporting legal mechanisms, such as practical guidelines and mutual agreement between the DDC officers and the airline should be developed in order to expedite the access of data for disease control. Secondly, for disease control agency, health education through HBC at port of entry health control office should be provided to all passengers from risk areas regardless of the presence of symptoms. Lastly, soon after this event, the government imposed more stringent measures for all incoming travelers; This and foreigners were obliged to impose quarantine and be tested for SARS-CoV-2. These measures should be continued, as well as the reduction of international inbound flights and tighter in-transit rules imposed.

Conclusion

This article provides comprehensive details of an outbreak investigation on a cluster of imported COVID-19 cases from Italy with an attack rate of 50%. The index case declared his travel history and symptoms early and sought appropriate care as recommended by the HBC. Awareness raising measures followed by timely contact tracing could reduce the transmission of disease. Proper screening and health care management system for PUIs and high-risk contacts at health facilities should be strengthened.

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