As of 2 January 2022, there were approximately 289 million confirmed cases of coronavirus disease 2019 (COVID-19) globally, with over 5.4 million deaths.\(^1\) Malaysia recorded its first confirmed COVID-19 case on 2 January 2020, and by 6 July 2020, a total of 8476 confirmed cases of COVID-19 were recorded, with 121 deaths. During that period, three clusters involving aged-care facilities were reported in Selangor state, resulting in 44 infections and five deaths.\(^2\) The first COVID-19 case that resulted in death involving a resident of an aged-care facility in the Klang district was notified to the Klang District Health Office on 27 March 2020 from a university hospital.

This report details the investigation and measures taken at this aged-care facility in Klang during the outbreak. The aims were (i) to verify the outbreak and cluster; (ii) to identify cases and describe the outbreak in terms of persons, place and time; (iii) to ascertain the outbreak source, classify at-risk groups and risk factors for disease transmission; and (iv) to implement infection prevention and control measures at the facility.
Telephone investigations were conducted with the staff of the facility to gain information about residents and staff. All residents and staff were screened as part of active case detection on 30 March. The information collected included demographic data, clinical symptoms and details of close contacts. Oropharyngeal or nasopharyngeal swab samples were taken and analysed by reverse transcription–polymerase chain reaction at the National Public Health Laboratory in Sungai Buloh. Repeat swab samples were also taken at the university hospital and were analysed at the hospital’s laboratory. A field assessment, which investigated the physical aspects of the facility and residents’ social interactions and activities, was conducted at the institution to ascertain possible contributing factors to the outbreak.

RESULTS

Epidemiology

On the day of mass screening at the facility, four individuals had already been admitted to the university hospital (one staff member and three elderly residents, one of whom had died). Swab samples were taken from the remaining staff and residents at the facility (a total of 14 individuals). The demographic and clinical details of each resident and staff member are outlined in Table 1.

The attack rate was 66.67% (6/9) among the residents and 55.56% (5/9) among the staff. The fatality rate among cases who tested positive for COVID-19 was 18.18% (2/11). The most common symptoms reported were fever, cough, shortness of breath and diarrhoea. The onset of symptoms for the index case was on 23 March, and onset for the last case was on 2 April. All confirmed cases were admitted to the university hospital ward for treatment and isolation. The three elderly residents with negative COVID-19 results were admitted to the university hospital ward for close monitoring and quarantine. Common features among both cases who died were advanced age (86 and 92 years old), the presence of comorbidities, fever at presentation and admission to the ward within 2 days after symptom onset.

The epidemic curve shows a point source outbreak (Fig. 1). The index case was a 92-year-old female with symptoms of fever, shortness of breath and diarrhoea. She had been to hospital previously for anaemia from 7–17 March. She was then discharged to the facility, where she developed symptoms of fever and diarrhoea on 23 March. She was readmitted to hospital on 25 March, but she developed shortness of breath and died 3 days later (Table 1).

The last case involved a 33-year-old female staff member with onset of fever and sore throat on 2 April. All residents and staff of the facility were at the facility during the outbreak period, which may have led to cross-infection during care work, therapy sessions and daily activities.

Laboratory investigation

There were 14 swab samples taken at the facility on 30 March, three of which tested positive for COVID-19. Fifteen swab samples were taken at the university hospital between 27 March and 7 April (Table 1). In total, there were 11 positive cases.

Environmental investigation

The facility is a two-storey bungalow with five bedrooms and four bathrooms, with a total area of about 353 m² (3800 square feet). There were three double-occupant rooms and two four-occupant rooms for the residents. All rooms had two occupants, except one double room with only one occupant. Common areas included a lounge, a dining room and a kitchen. Outside of the building is an open space used for physical activities. Air conditioning is used constantly at the facility, and windows generally remain closed. Activities conducted individually included personal care, regular health check-ups and physiotherapy sessions. However, caregivers and the physiotherapist attended to multiple residents. Group activities included meal times, exercise and social activities.

Infection prevention and control

Health education was delivered to the facility’s management about infection prevention and control measures for
### Table 1. Demographic information and COVID-19 disease course among residents and staff at an aged-care facility, Klang district, Selangor, Malaysia, 2020

| Age | Sex | Ethnicity  | Comorbidity                     | Symptoms                        | Symptom onset date | Sample dates and results | Admission date | Outcome                  |
|-----|-----|-----------|---------------------------------|---------------------------------|--------------------|--------------------------|----------------|--------------------------|
|     |     |           |                                 |                                 |                    | Care facility            | University hospital|                          |
|     |     |           |                                 |                                 |                    | 03.04.2020 Positive    |                |                          |
|     |     |           |                                 |                                 |                    | 04.04.2020             |                |                          |
|     |     |           |                                 |                                 |                    | 01.04.2020 Positive    |                |                          |
|     |     |           |                                 |                                 |                    | 01.04.2020             |                |                          |
|     |     |           |                                 |                                 |                    | 03.04.2020 Negative    |                |                          |
|     |     |           |                                 |                                 |                    | 07.04.2020 Positive    |                |                          |
|     |     |           |                                 |                                 |                    | 08.04.2020             |                |                          |
|     |     |           |                                 |                                 |                    | 03.04.2020 Negative    |                |                          |
|     |     |           |                                 |                                 |                    | 04.04.2020             |                |                          |
|     |     |           |                                 |                                 |                    | 03.04.2020 Negative    |                |                          |
|     |     |           |                                 |                                 |                    | 01.04.2020             |                |                          |
|     |     |           |                                 |                                 |                    | 01.04.2020             |                |                          |
| 30  | Female | Chinese  | DM, hypertension, CKD           | Fever, cough, diarrhoea        | 01.04.2020          | 01.04.2020 Positive    |                | Deceased (16.04.2020) |
|     |     |           |                                 |                                 |                    | 01.04.2020             |                |                          |

CKD: chronic kidney disease; CVD: cardiovascular disease; DM: diabetes mellitus.

Dashes indicate that the category is not applicable.
A few mechanisms may have prompted SARS-CoV-2 transmission at the facility. First, SARS-CoV-2 is transmissible even while a case is asymptomatic or presymptomatic. This phenomenon has complicated efforts to isolate infected individuals. Evidence shows that asymptomatic individuals may be infectious as early as 12.3 days (95% confidence interval: 5.9–17 days) before symptom onset. Second, the residents’ demographic factors, such as older age and the presence of comorbidities, predisposed them to greater risk of severe infection, with complications and death. Third, the shared use of rooms and bathrooms, group activities and social interactions at the facility may have precipitated the spread of infection among the residents. Fourth, the facility was fully air-conditioned, which hindered natural ventilation, thus predisposing residents and staff to the spread of airborne infection.

Based on the experiences in this outbreak, we have outlined a few recommendations for improvements to outbreak prevention and control measures in similar facilities. First, upon receiving an outbreak notification, a rapid assessment team should conduct a thorough risk assessment of the facility and its occupants (both residents and staff). Second, a high index of suspicion should be adopted to identify symptomatic positive cases early and isolate them from the rest of the residents and staff.
Third, hospital admission should be considered early for elderly residents because they are at great risk for rapid, unpredictable deterioration from SARS-CoV-2 infection. Fourth, repeat testing should be considered in view of the possibility of continuous exposure to asymptomatic cases. Finally, the use of natural ventilation should be encouraged, especially during the day, and windows and doors should be regularly opened at the facility.

Among the limitations of this outbreak investigation were the small sample size and lack of completeness in patient data because they were gathered through telephone interviews with third parties, that is, management staff. Additionally, an outbreak transmission tree could be established through molecular sequencing to better explain the chronology of the outbreak.

Conclusions

COVID-19 outbreaks at aged-care facilities are serious events, as residents are at high risk of morbidity and mortality. In the outbreak at the aged-care facility in Klang district, health authorities took appropriate measures by conducting mass screening at the facility and isolating elderly residents in the hospital. Specific guidelines for managing institutional COVID-19 outbreaks, such as those occurring at aged-care facilities, should be prepared by ministries of health and other appropriate agencies.

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Conflicts of interest

None declared.

Ethics statement

Ethics approval was not required.

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