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Coronavirus disease (COVID-19) became a pandemic in 2020.1 Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmits via social activity of family, friends, and coworkers.2,3 Families are a transmission route for SARS-CoV-2 because of close contact.4 The current public policy is quarantine for at least 14 days, based on the incubation period5 or until the patient has tested negative three days in a row using the SARS-CoV-2 reverse transcription polymerase chain reaction (RT-PCR). Monitoring the viral load will be a valuable method to reduce the optimal quarantine days, especially in asymptomatic carriers.6 Identifying asymptomatic carriers within a family is important to guide quarantine policy.7 In East Asia, grandparents, parents, and children living together is a common tradition, a pattern also seen in Taiwan.8 Our study aimed to investigate a three-generation family cluster of COVID-19.

We report a family cluster with six individuals infected with coronavirus disease in Taiwan. The household cluster with COVID-19 infection status is summarized in Table 1 and Supplemental Fig. 1. All dates mentioned henceforth are in 2020. Patient 1 is an 85-year-old, bed-ridden man with diabetes, hypertension, and continuous ambulatory peritoneal dialysis who was admitted to the hospital with pneumonia on...
In the household of this three-generation Taiwanese family, the infection rate was 60%. The probable cause of transmission would be normal family interaction, such as taking care of older family members and routine visits. The ratio of males to females was 4:2, and the age range was 11–85 years. The prevalence of asymptomatic disease was 33.3% (2/6),

Our report shows that the youngest asymptomatic case had shorter throat swab conversion time and disease course. By contrast, elderly family members may experience severe pneumonia, particularly with comorbid diseases, and death. Older patients had longer throat swab conversion and prolonged potential quarantine duration even after symptoms had improved. This highly contagious disease, when found in a traditional family structure, transmits to other household members of different ages and has the potential to infect all family members. If there is an insufficient quarantine period, the grandparents with pneumonia who are admitted to the hospital could be the source of nosocomial infection, and the parents will then transmit it to their colleagues. In Taiwan, a high attack rate was observed within 5 days of detection of a symptomatic index case than observed >5 days. The attack rate was higher among household family contacts than that in health care settings.

Table 1

| Characteristic                  | Patient Number |
|---------------------------------|----------------|
| Age (years)                     | 85 74 53 49 11 31 |
| Comorbidities                   | Taking care Taking care Taking care Taking care Hospital visit Taking care |
| Probable cause of transmission  | Taking care Taking care Taking care Taking care Hospital visit Taking care |
| Symptoms onset                  | Feb. 9 Jan. 29 Jan. 31 Jan. 29 Jan. 29 NA NA |
| Symptoms status                 | SB Sore throat Cough, fever Sore throat NA NA |
| Throat swab+                    | Feb. 21 Feb. 23 Feb. 23 Feb. 25 Feb. 24 |
| Throat swab-                    | NA Mar. 28 Mar. 30 Mar. 26 Mar. 2 Mar. 28 |
| Status                          | Mar. 20 Apr. 6 Apr. 6 Mar. 6 Mar. 13 Apr. 1 |
| Virus conversion (days)         | >29 35 37 4 7 34 |
| Course of disease (days)        | >41 59 59 29 7 34 |

Course of disease: from symptoms to throat swab conversion or SARS-CoV-2 positive to negative in no symptomatic infection. SB: shortness of breath, NA: not applicable.

For this retrospective observational study, the informed consent waiver was received from IRB and the patient privacy rights including any individual person’s data in any form (including individual details, images, or videos) are observed. This study was

Author statements

Ethical approval
approved by the Institutional Review Board of Taipei Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation (approval number 09-X-041) and conducted in accordance with the amended Declaration of Helsinki.

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Competing interest

The authors declare that they have no conflicting interests.

Authors’ contributions

MCY, PPH, and WLS collected the data. WLS and YCC conceived the idea and drafted the paper. YKW, MYP, CCL, and PSW reviewed the article. All authors read and approved the final manuscript.

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