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Epidemiology of COVID-19 Outbreak in Japan, from January–March 2020

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Infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causes coronavirus disease 2019 (COVID-19), and this disease typically leads to a febrile illness with respiratory symptoms (1,2). The disease was first detected in Wuhan, China. The World Health Organization then declared this disease as a global pandemic on March 11, 2020. In Japan, the first patient with COVID-19 was detected on January 15. By March 20 and 31, 2020, the number of COVID-19 cases reached 1,000 and 2,000 patients, respectively. Herein, we report the situation and brief epidemiology of the COVID-19 outbreak in Japan by analyzing the 2,175 cases detected between January 15 and March 31, 2020.

Figure 1A shows the epidemic curve of laboratory-confirmed COVID-19 cases. Laboratory tests for COVID-19 were performed using reverse transcription polymerase chain reaction (RT-PCR) based on a protocol developed by the National Institute of Infectious Diseases, Japan (3). Japan has implemented a targeted testing strategy; we have described these criteria in a subsequent section. Demographic and epidemiological information of all patients, such as contact and travel history, were reported from the local governments to the Japanese Ministry of Health, Labour and Welfare. During the study period, laboratory tests for SARS-CoV-2 were conducted for 32,002 cases, out of which 2,175 cases were affirmative (6.8% positivity). The present report excludes 696 cases including 7 deaths detected on the cruise ship Diamond Princess, which anchored at Yokohama Port from February 3 to March 1. Details regarding the outbreak on the cruise ship have been reported elsewhere (4). This report also excludes cases among citizens who flew back to Japan (returnees) via chartered flights from Wuhan between January 29 and February 17.

Between January 15 and February 10, the majority of cases (11/16) were imported from China, and the remaining reported a contact history with travelers from China. Thereafter, a gradual accumulation of cases without known linkage to imported cases was observed, which suggested a local transmission of the disease. While the number of COVID-19 cases reported per day markedly decreased in China, a surge in the number of COVID-19 patients was reported in Europe and the U.S. in March. Concurrently, the proportion of imported cases in Japan increased once again in mid-March. By March 31, the total number of countries considered as probable sources of importation of COVID-19 cases to Japan reached >30, including African, Asian, European, and North and South American countries, and 51% (138/271) of the imported cases originated from Europe. The proportion of imported cases decreased again in late March because of a partial restriction on international travel to Japan and the implementation of quarantine regulation for inbound travelers. In addition to the 271 imported cases, quarantine screening at international airports identified 56 laboratory-confirmed cases (however, they are excluded from the 2,175 cases reported in the current study).

Public health officers in Japan have conducted exhaustive contact tracing and have tested samples collected from contacts with symptoms. Consequently, 63% (1,194/1,904) of the local cases displayed an epidemiological linkage to known confirmed cases. Such linkages were observed among family members, in healthcare facilities, and nursing homes. Events and venues at which super-spreading might have occurred included a houseboat, dinner parties, a trade exhibition in a conference hall, and live music concerts in clubs. Clusters of COVID-19 cases were also detected among gym users and members of chorus groups. From these observations, the "Three Cs," namely, "Closed spaces with poor ventilation," ""Crowded spaces with many people," and "Close contact," such as from intimate conversations, loud cheering, singing (e.g., karaoke), or

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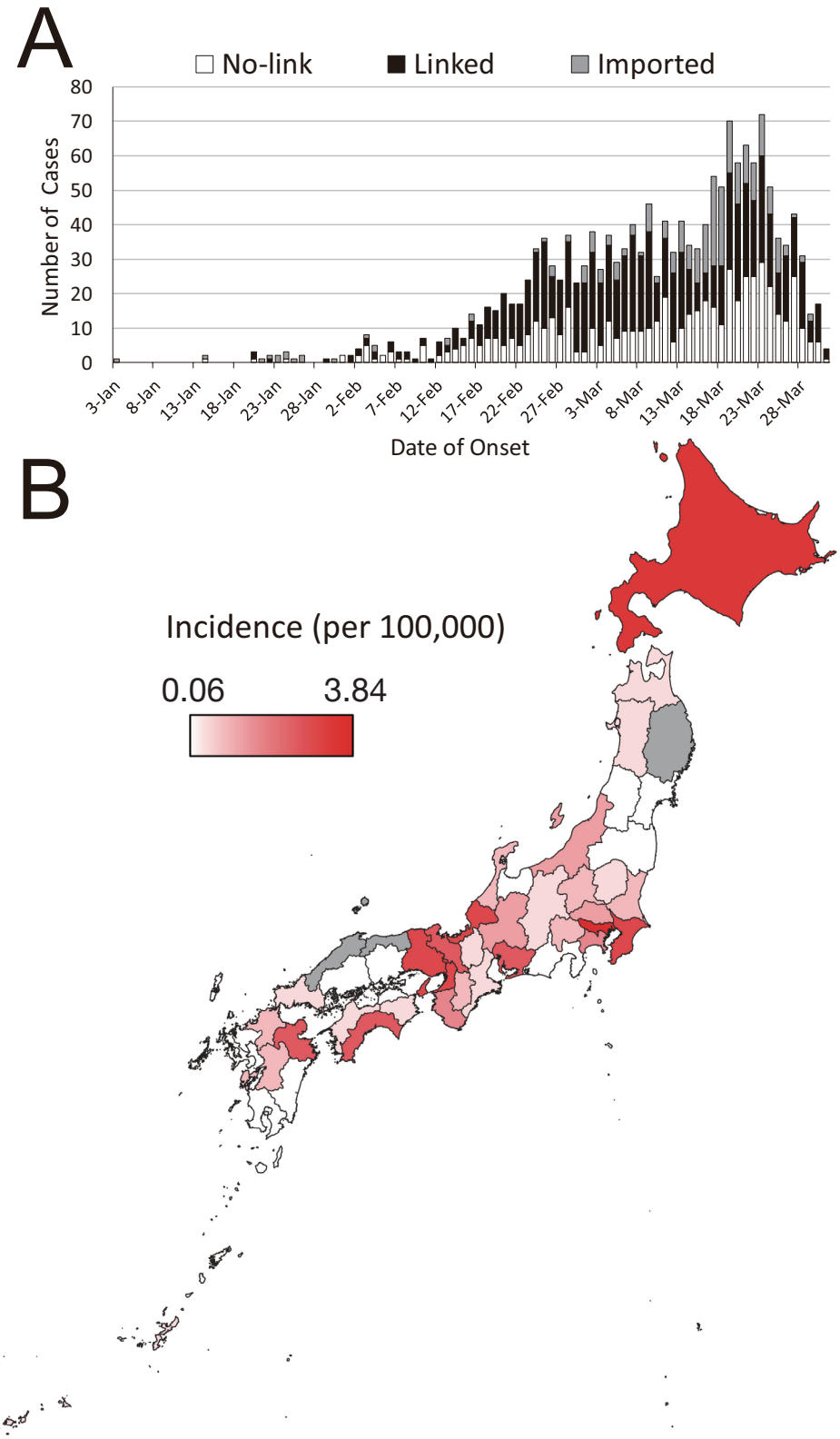

Fig. 1. Temporal and geographical distribution of COVID-19 cases in Japan between January and March, 2020. A) Epidemic curve of laboratory-confirmed COVID-19 cases classified by imported and local cases with (Linked) and without (No-link) epidemiological linkage to known cases. Excluded from the graph are cases with no information of date of onset. B) Prefectures are colored by COVID-19 incidence. Prefectures shaded in gray reported no cases.

exercise within a close proximity to other persons, were proposed as important factors that form a COVID-19 cluster. Geographically, COVID-19 cases were reported from 44 of 47 prefectures, with heterogeneity of incidence among prefectures; incidence was particularly high in urban areas (Fig. 1B). As of March 31, the incidence of COVID-19 in Japan, excluding imported cases, reached 1.5 per 100,000-capita.

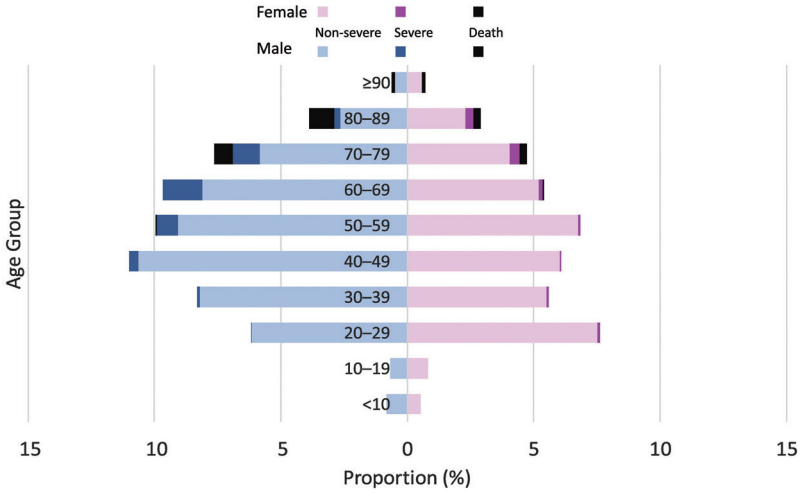

Fig. 2. Age distribution and severity of COVID-19 cases detected in Japan between January 15 and March 31, 2020. Age distribution is indicated by sex and proportion of severity.

As observed in many countries (5–7), the majority of cases were aged 20 years or older, whereas children accounted for a small proportion (Fig. 2). Out of all cases, 7.7% (167/2,175) of the patients presented with severe illness, which was defined as patients who required tracheal intubation, those who were treated in the intensive care unit, and those who died. A total of 56 deaths were reported during the study period (case fatality rate: 2.6%). The fatality rate and proportion of severe cases were higher for those aged over 60 years. Males accounted for 59% of all cases and were more likely to develop severe illnesses (10.3% in males and 4.6% in females).

In Japan, testing is conducted when a patient has i) a travel history from affected areas outside Japan, ii) an epidemiological linkage with confirmed cases or with international travelers from affected areas, iii) pneumonia symptoms requiring hospitalization, especially with a high risk of developing severe diseases, or iv) when a medical doctor strongly suspects the disease and requests testing based on comprehensive judgment. The third criterion was added on February 27. Patients with very mild illness are generally advised to stay at home, and when symptoms persist, they should contact a call center that will instruct them to visit a designated testing center at a specific time. The implementation of the strategy reduces the transmission risk of SARS-CoV-2 from patients with COVID-19 to others at testing centers, which could be crowded. The national regulations that were introduced on February 1 required hospitalization of all laboratory-confirmed cases including cases with no or mild symptoms. This regulation was changed in March to enable laboratory-confirmed cases with no or mild symptoms to remain in designated facilities and/or self-isolate at home to reserve the available hospital beds for patients with severe illnesses and at high risk to develop severe diseases.

Japan reported 2,175 cases of COVID-19 within 77 days of the first detected case. The mechanisms underlying the slow growth of the epidemic compared to other countries remain unclear (8). Japan has implemented a cluster-focused measurement and intervention as a response to the outbreak. Detailed analysis of clusters and effectiveness of the strategy are ongoing. Nonetheless, the number of new infections continues to increase on a daily basis (Fig. 1A). People in Japan must remain vigilant, active, and united; effective countermeasures should be implemented to avoid the simultaneous collapse of the health system and socioeconomic stability.

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Conflict of interest None to declare.

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