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Rapid Communication

Disappearance of summer influenza in the Okinawa prefecture during the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic

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ABSTRACT

Since the Okinawan islands are located in the southernmost part of Japan, where the climate is subtropical, several episodes of influenza epidemics occur during the summer season. More recently, we have demonstrated that summer influenza epidemics occur every year. After the outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) began in January 2020, measures to avoid disease transmission have been widely promoted in Japan, such as the use of masks, handwashing, remote work, and cancellation of large events. These measures might also have reduced the spread of other infectious diseases, such as the seasonal influenza. Based on this background, we evaluated weekly influenza activity in the 2019/2020 season. After the SARS-CoV-2 pandemic, the summer influenza in the Okinawa prefecture disappeared in 2020. The reasons for the disappearance of summer influenza in Okinawa are discussed herein.

In subtropical areas such as Taiwan, Hong Kong, and Singapore, influenza epidemics are observed throughout the year and influenza pandemics frequently occur in the summer season [1]. Since the Okinawan islands are located in the southernmost part of Japan (latitude 26°N), where the climate is also subtropical, several episodes of influenza epidemics occur during the summer season [2–7]. It has been reported that summer influenza is one of the main causes of acute respiratory infections in children and adults in the summer season in the Okinawa prefecture [4]. In addition, in previous

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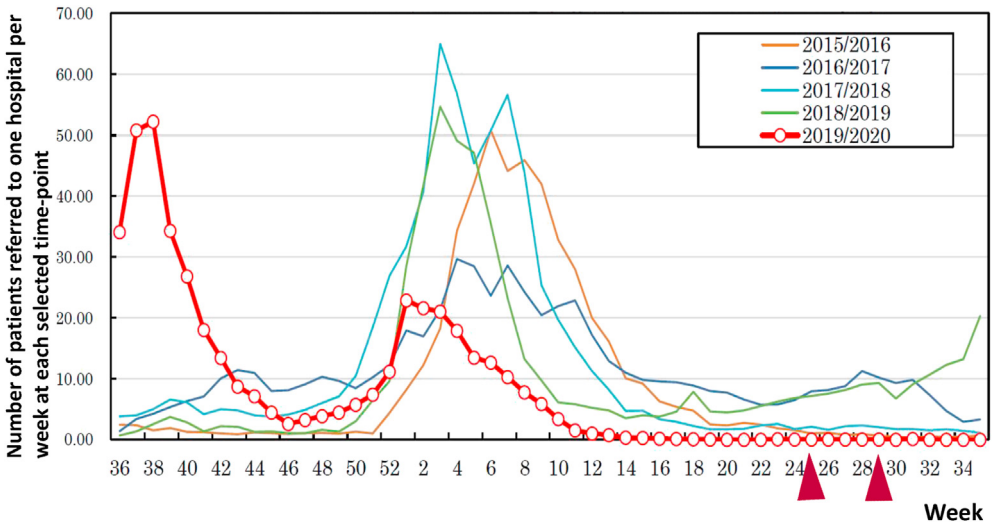

Fig. 1 – Plot of influenza patients from September 2019 to January 2020 in Okinawa, Japan. The horizontal bar represents the number of patients referred to one hospital per week per selected time points. Data from the 2015/16, 2016/17, 2017/18, 2018/19, and 2019/20 summer seasons are shown. In September 2019, a peak is observed. After the SARS-CoV-2 pandemic, the summer influenza in the Okinawa prefecture disappeared.

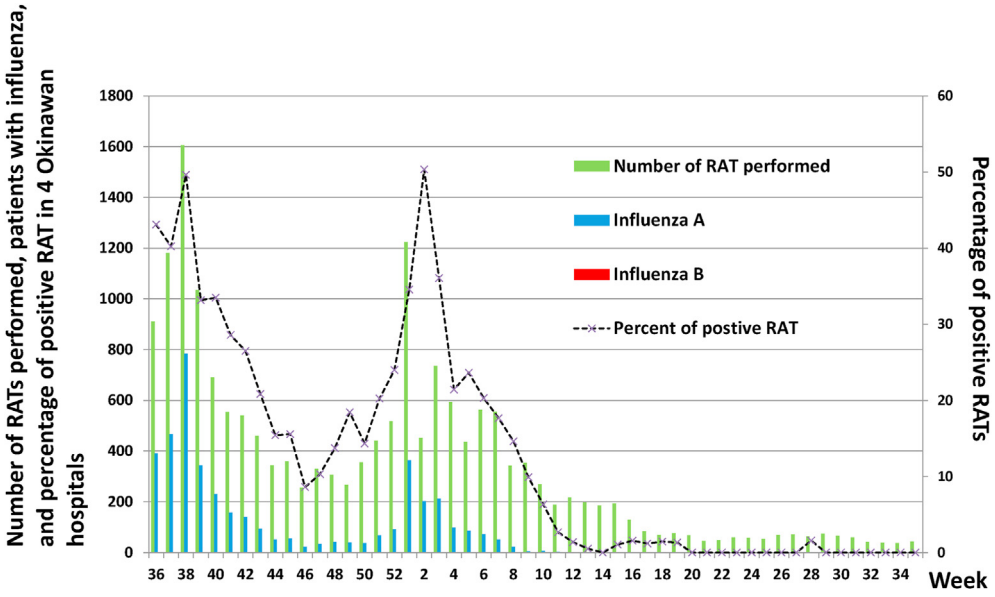

Fig. 2 – Epidemiology of the influenza virus infection in Okinawa, Japan. Green bars indicate the number of RATs performed. Blue and red bars indicate the number of influenza A or influenza B infections detected by RATs, respectively, between September 2019 and September 2020 from four representative hospitals. The dotted line represents the percent of positive RATs. After the SARS-CoV-2 pandemic, the summer influenza in the Okinawa prefecture disappeared. The total numbers of RAT performed in four hospitals from the first week to the 35th week were 20,485 in 2015/2016 season, 27,522 in 2016/2017 season, 25,667 in 2017/2018 season, 25,575 in 2018/2019 season, and 17,915 in 2019/2020 season, respectively. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

studies, we have demonstrated that influenza B viruses play an important role in summer epidemics [5,6].

Since the outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) began in January 2020, measures to avoid disease transmission have been widely promoted in Japan, such as the use of masks, handwashing, remote work, and cancellation of large events. If effective, these measures could also reduce the spread of other infectious diseases, such as seasonal influenza. Based on this background, we evaluated weekly influenza activity in the 2019/2020 season.

From September 2019 to September 2020, two individual influenza surveillance datasets were collected from external sources [6]. The first dataset included a nationwide surveillance of influenza diagnosed by rapid antigen test (RAT)

results and/or influenza-like illness symptoms. The Japanese national influenza surveillance is conducted in approximately 5000 sentinel healthcare facilities throughout Japan; among them, 55 facilities are located within the Okinawa prefecture. Data from these 55 sentinel healthcare facilities within Okinawa were extracted from the Infectious Diseases Weekly Reports, which are published by the National Institute of Infectious Diseases in Japan. This surveillance dataset included the age distribution of patients diagnosed with an influenza infection based on either a positive RAT result and/or the presence of symptoms from influenza-like illness. Influenza-like illness was defined according to the following four criteria: (1) acute onset of symptoms, (2) high fever, (3) upper respiratory symptoms, and (4) general symptoms, such as malaise, headache, and myalgia. Patients with either a positive RAT result or those who met all four influenza-like illness criteria were added to the database.

The second dataset included the weekly RAT results from four representative general hospitals located in the capital city of Okinawa. The clinical laboratories of the following four general hospitals reported the results of the RATs for the influenza virus weekly to the Clinical Laboratory Center of the Medical Association: Naha City Hospital (470 beds), Okinawa Red Cross Hospital (314 beds), Okinawa Prefectural Nanbu Medical Center (434 beds), and Urasoe General Hospital (311 beds). Data accessed from the Clinical Laboratory Center of the Medical Association included only the total number of tests administered and the number of positive influenza A, B, or A/B co-infected results.

For dataset 1, the Japanese national sentinel surveillance data are shown in Fig. 1. Epidemic curves from this dataset were aligned and analyzed in the five recent seasons. As demonstrated in this figure, summer influenza in Okinawa disappeared in 2020.

For dataset 2, local surveillance of the influenza virus infection by RATs is demonstrated in Fig. 2. Epidemic curves from this dataset were aligned and analyzed for the number of RATs performed, number of patients with influenza A, number of patients with influenza B, and percent of positive RAT results. As demonstrated in Fig. 2, although a significant number of RATs (around 50 RATs every week) were performed, the number of patients with influenza was very low in the summer season in 2020.

In the present study, we clearly demonstrate that the summer influenza in the Okinawa prefecture disappeared in 2020. It has also been reported that seasonal influenza activity is lower in 2020 than in previous years in Japan [8]. In addition, it has been suggested that cases of the flu dropped in the Southern Hemisphere. From Chile to South Africa to New Zealand, countries reported far lower numbers of influenza cases.

Although influenza activity in the 2019/2020 season was moderately severe in other parts of the world [9], influenza activity in our study may have been affected by temperature [5,6,10], virulence, or by the preventive measures taken to curb the SARS-CoV-2 outbreak. There could be several possible explanations for the disappearance of summer influenza in the Okinawa prefecture. First, widespread restrictions following SARS-CoV-2 pandemic, such as school closures, mask-wearing, travel restrictions, and social distancing, may have played a significant role. Moreover, awareness regarding these measures to reduce the risk of disease transmission was high among the Japanese public from the beginning of the year.

Second, school closures and suspension of large events occurred late in the influenza season; school closures prevented the spread of influenza, which could have been part of the reason why many clinics experienced a decline in other respiratory illnesses in 2020 as compared to the previous year. Children are the main reservoirs of these viruses; their absence from childcare facilities might have lowered the chances of spreading the viruses in the community.

Third, restrictions on incoming air travel during the Northern Hemisphere's flu season might have helped to prevent travelers from bringing the flu to the Southern Hemisphere and vice versa. Strict border restrictions and alert-based responses, including social distancing measures, might have had an impact.

Finally, concerns regarding the SARS-CoV-2 outbreak might have changed the detection of influenza through changes in symptomatic individuals seeking medical attention or changes in physicians' inclinations to test for influenza. There has also been an increased use of telemedicine, which means that patients can contact providers without visiting doctors' offices or hospitals, where the risk of infection is higher. However, as demonstrated in Fig. 2, although a significant number of RATs was performed in several hospitals, detection of influenza was extremely rare in the Okinawa prefecture. Therefore, the disappearance of summer influenza should not be attributed to the diminishment of RATs during the SARS-CoV-2 outbreak.

In conclusion, our study clearly demonstrated the disappearance of summer influenza in the Okinawa prefecture after the pandemic of SARS-CoV-2.

Conflict of Interest

The authors have no conflicts of interest to declare.

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