

# Seasonal influenza activity in young children before the COVID-19 outbreak in Wuhan, China

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## Abstract

The activity of influenza A at the end of 2019 was higher than previous two years in children younger than 6 years old in Wuhan, China. The 2019-20 seasonal influenza winter outbreak preceded the COVID-19 outbreak, with a higher and earlier peak than that of the 2017-18 and 2018-19 seasons. We speculate this could be due to the earlier CNY holiday season in 2019-20 than in previous two years. We compared these results with those of two previous studies to further discuss the possible interference between influenza and COVID-19 in young children.

Keyword: COVID-19; influenza; children;

Dear Editor,

During the first wave of COVID-19 in China, the attack rate of coronavirus disease 2019 (COVID-19) in children was much lower than in adults, and most child cases had mild symptoms<sup>11</sup>. In the first epicenter Wuhan, China, there was only one paediatric case of COVID-19 officially reported before January 22, 2020. However, the secondary attack rate of COVID-19 among close contacts was later found similar between children and other age groups.<sup>2</sup> The reasons why children were exempted from COVID-19 infection remain unclear. One hypothesis is the potential interference of seasonal influenza peaks with the newly-emerging COVID-19 outbreak among young children. Liu *et al*<sup>3</sup> reported that 11% and 1.6% of 366 hospitalized children were infected by influenza and SARS-CoV-2 in early January 2020 in Wuhan, China. Kong *et al*<sup>4</sup> found that the incidence rates of influenza-illness-like (ILI) were substantially higher in the 2019-20 season than in the previous two years based on the surveillance data in two hospitals in Wuhan, China. The retrospective laboratory tests in the specimens from these ILI patients to January 2020 showed that an outbreak of seasonal influenza attacked the  $\leq 30$  age group in October-November 2019, followed by the COVID-19 cases in the  $> 30$ -years age group that first emerged in December 2019 to January 2020. Surprisingly, no COVID-19 case was found in the  $\leq 30$  age group in their 120 samples (Table 1). Thus there is a clear inconsistency between the studies by Kong *et al* and Liu *et al*, as one would expect some COVID-19 cases among the young age group by the mid-January in Wuhan, China.

We obtained the test results of 194,672 specimens from the Maternal and Child Health Hospital of Hubei Province in Wuhan. These specimens were collected from 1 January 2017 to 20 May 2020, for immunofluorescence tests of influenza type A and B. Around 75% of the specimens were taken from the outpatients and inpatients aged  $\leq 6$  years old. In consistent with the findings by Kong *et al*<sup>3</sup>, we also found a peak of influenza A in early January, coinciding with the start of the COVID-19 outbreak. It is interesting to note that the winter peak of seasonal influenza in Wuhan appeared in early January 2020, nearly one month earlier than those in 2017-18 and 2018-19. The difference in the peak time could be associated with an international event in late October but the earlier lunar calendar cycle could be another reason (e.g., Chongyang festival was on October 28 in 2017, October 17 in 2018 and October 7 in 2019).

If the generation interval of seasonal influenza was assumed to be same as that of COVID-19 (mean 5 days and standard deviation 4 days), the transient reproductive number of influenza was around 2 in the growth phase, which was comparable to that of COVID-19. We observe a sudden drop of influenza A cases in early January 2020, presumably due to social distancing and avoidance of hospital visits immediately after the official report of pneumonia clusters of COVID-19 and closure of the Huanan Seafood market on December 31, 2019.

Figure 1. Influenza activity from January 2017 to May 2020 in Wuhan, China. The top panel shows weekly numbers of specimens positive for influenza A (black triangle) and influenza B (red square). The blue curve shows weekly numbers of reported COVID-19. The bottom panel shows weekly positive rate for influenza A and B.

Infection risk of COVID-19 was known to increase with age<sup>5</sup>. If we assume that the ratio of COVID-19 to influenza cases in the  $<30$  age group was not less than that in the  $<16$  age group and similar across different hospitals, we could derive a ratio of 0.136 (1.6% / 11.80%) based on reference [3]. Given the influenza positive rate of 60% from reference [4], we would expect that around 8% of COVID-19 would have occurred in ILI patients under 30 years old. Hence, the chance of having zero COVID-19 cases in the  $<30$  age group of ILI

cases, as reported in reference [4], was estimated to be very low ( $0.002 = [(1-0.08)^{75}]$ ), given the total number of 75 specimens collected in their study for this age group.

It is of note that Kong et al collected the data from pediatric inpatients and outpatients from three general hospitals in Wuhan, whereas Liu et al collected the data from one pediatric hospital and one general hospital. We showed that the results from samples of such size from a few hospitals could not well match with each other in the initial stage of the pandemic. Taken together, the exemption from COVID-19 infection in the <30 age group in the early phases of the COVID-19 outbreak might have been due to underreporting whereas the potential interference between influenza and COVID-19 cannot be ruled out. Studies with a large sample size from different regions are warranted to investigate the interaction between seasonal respiratory viruses and SARS-CoV-2, particularly in children.

## **Declaration**

### **Ethical Approval and Consent to participate**

The ethical approval has been obtained from the Maternal and Child Health Hospital of Hubei Province. Individual consents were exempted as the aggregated data were used in this study.

### **Availability of data and materials**

All data used are from public domain.

### **Competing interests**

DH was supported by an Alibaba (China) Co. Ltd. Collaborative Research project. Other authors declare no conflict of interest.

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### **Authors' contributions**

All authors conceived and conducted the research and wrote the draft. All authors critically revised the manuscript, and all authors approved the submission.

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