Letter to the Editor

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A trend for decrease of influenza infections in children during the first wave of COVID-19 observed in a Chinese hospital

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To the Editor,

Since its outbreak, COVID-19 has caused 172,630,637 infections and 3,718,683 deaths in 222 countries and territories over the world [1]. Due to its highly contagious characteristics, the world has taken prevention and control measures to manage the pandemic, such as closure of schools. Strict isolation and intensive monitoring of close contacts for 14 days have proved as efficient measures to control the spread of the disease [2]. On January 25th, 2020, Henan Province started the strictest prevention and control measures to response to COVID-19, including banning crowds and meetings, closure of markets and theatres, suspension of classes and closure of factories.

Influenza virus is an RNA virus which can cause influenza in human and animals, belonging to the orthomyxoviridae family on classification. It can cause acute upper respiratory infection and it mainly spreads through the air, droplets and touch [3]. Influenza mainly affects young children, and it is a serious burden to children as well as hospital resources, and the infected children are the main sources of infection [4, 5]. Influenza virus and SARS-CoV-2 which causes COVID-19 have common routes of transmission including close contact and droplets, so it’s hypothesized that the prevention and control measures of COVID-19 might result in a significant influence on the infection of influenza. The present study aimed to investigate the influence of those measures on the rate of infection of influenza in children.

Influenza-like illness (ILI) manifests with some or all of the symptoms including fever, cough, sore throat, runny, body aches, headaches, fatigue, vomiting and diarrhea [6]. The present study included children who manifested with ILI and visited the outpatient clinic or emergency room at the Children’s Hospital Affiliated to Zhengzhou University. We studied the influenza infections in children for eight weeks following the start of the strictest response to COVID-19, from January 25th to March 20th, 2020 (the second period). For the control period, we studied the influenza infections three weeks before January 25th, from January 4 to 24th (the first period). The corresponding periods of the first and the second periods in 2019 were also included for the control study, from January 4 to 24th (the third period) and from January 25th to March 21st (the fourth period). The children included in the study were grouped according to age: babies (0–1 years), infants (1–3 years), pre-school age (3–6 years), school age (6–10 years) and 10–18 year olds.

Qualified medical personnel collected pharyngeal excretions from each child using throat swabs. The collected excretions were then tested for influenza virus antigen using the Flu A/B Virus Antigen Detection kit (colloidal gold immunochromatography method) (Intec PRODUCTS, INC, Xiamen, China) according to the manufacturer’s instructions. The results are judged as influenza A, B or A combined with B according to the rules. Dates were analysed using SPSS (version 22.0). Chi-square tests were used to analyse qualitative data. A p-value <0.05 was considered statistically significant.

In the study, 55,929 children were included in the total four periods studied (Table 1), and we registered the number of influenza positive cases in each week. The number of total influenza positive cases decreased sharply from the first period to the second period, and fell to nearly 0; while the trend in 2019 was obviously different, and there were large
numbers of positive cases detected all the time (Figure 1). Statistical analysis showed that the positive rates of influenza in 2020 were significantly lower than those in the corresponding periods in 2019 (p<0.01). The positive rate in the second period was significantly lower than that in the first period (p<0.01) (Table 1). The strictest prevention and control measures reduced the contacts among people, which resulted in a cutoff of the transmission routes and a restriction of the influenza infections. The decreasing trend in the number of total positive influenza cases in 2020 and the lower positive rates demonstrated the great effect of the prevention and control measures on the influenza infections. It may thus be reasonable to use influenza as a surrogate marker to estimate the contribution of the prevention and control measures to curb COVID-19 spread [7], and the study may provide experiences for the future prevention and control of influenza.

Part One shows the trend in 2019, and part Two depicts the trend in 2020. “Total”: the total number of influenza infections; “A”: the number of influenza A infections; “B”: is the number of influenza B infections.

In the present study, the trend of the infections with influenza A was similar to that of the total influenza infections in the four periods and decreased from the first to the second period; while the number of infections with influenza B increased in the first period and decreased in the second period and increased from the third to the fourth period (Figure 1). The trends demonstrate that the prevention and control measures had an influence on the infection of both types of influenza. Among the positive cases, the rates of influenza B in the first and second period were both higher than those in the corresponding periods of 2019 (p<0.01), and the rate in the second period was higher than that in the first period (p<0.01) (Table 1). Because of the total amount of influenza infections consisted largely of influenza A, the changes in the number of influenza A infections had a considerable effect on the decrease of total influenza infections. Because of the decreased rate of influenza A and increased rate of influenza B in 2020, the prevention and control measures might play a major role mainly through the suppression of influenza A. Due to the decrease of influenza A and increase of influenza B infections in the fourth period, the seasonal factors might also have an effect in the decrease of influenza A and increase of influenza B rates in the second period of 2020.

The rates of influenza infections observed in children of different age groups were 40.30% for pre-school age, 30.19% for infants, 14.50% for school age, 13.64% for babies and 1.43% for 10–18 year olds. The infection rate of babies in 2020 was higher than that in 2019 (14.96 vs. 13.29%), and it was higher in the second period than that in the first period (16.44 vs. 14.76%). The differences in the infection rates between children of different ages might be due to different immunities and crowding characteristics.

| Table 1: The number of children tested and positive for influenza at different time periods and positive numbers at different ages. |
|---|---|---|---|---|---|
| Time periods | 2019.1.4-19.1.24 | 2019.1.25-2019.3.21 | 2020.1.4-2020.1.24 | 2020.1.25-2020.3.20 |
| Total tested | 13,958 | 22,345 | 12,437 | 7,189 |
| Positive | | | | |
| Total | 5,964 | 8,120 | 3,178 | 433 |
| A | 5,878 | 6,692 | 2,716 | 213 |
| B | 42 | 1,296 | 443 | 219 |
| A + B | 44 | 132 | 19 | 1 |
| Age, years | | | | |
| 0–1 | 695 | 1,156 | 469 | 72 |
| 1–3 | 1,568 | 2,701 | 883 | 146 |
| 3–6 | 2,667 | 2,980 | 1,357 | 150 |
| 6–10 | 907 | 1,222 | 430 | 47 |
| 10–18 | 125 | 81 | 40 | 8 |

A identifies positive influenza A; B identifies positive influenza B; A + B identifies cases infected by influenza A combined with B.

Figure 1: The trend of influenza infection in children with time in 2019 and 2020.
There were no obvious changes in crowding characteristics of babies before and after the prevention and control measures taken, and those measures might not have a direct influence on the infection of babies, and the rate of babies among positive cases increased after those measures carried out.

In conclusion, the prevention and control measures of COVID-19 could significantly reduce the infection of influenza in children through the reduction of contacts. The prevention and control measures might exert a greater influence on influenza A than on influenza B and had the lowest influence on babies among all age groups.

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Ethical approval: Our study was approved by the Ethics Committee of the Children’s Hospital Affiliated to Zhengzhou University.

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