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Epidemiology Communication

Ongoing Shift Toward an Earlier RSV Season in Children: The Case of Saitama After the COVID-19 Pandemic

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ABSTRACT: Epidemics of respiratory syncytial virus (RSV) infection previously followed a predictable and seasonal pattern. However, the emergence of COVID-19 and the accompanying public health measures disrupted RSV seasonality worldwide. To investigate the long-term epidemiological impact, we analyzed weekly RSV-related hospitalizations in children under 15 years of age from 2018 to 2024 in Saitama Prefecture, Japan. During the COVID-19 pandemic, RSV admissions notably declined in 2020, but the number of hospitalizations returned to pre-pandemic levels. The peaks of admission rates occurred in March, in both 2023 and 2024, which were earlier than the August peaks seen in 2018 and 2019. We also found that the proportion of hospitalized patients aged ≥2 years increased notably to 30% in 2021 and 2022, and declined to 21.2% in 2024. Although an upward trend in intubation rates was observed, no statistically significant differences were found. These findings suggest that the COVID-19 pandemic led to earlier RSV outbreaks and temporary shifts in age distribution. It remains unclear whether RSV seasonality and age patterns will return to their pre-pandemic status. Ongoing surveillance is essential to better predict future outbreaks and inform optimal timing for preventive interventions, such as vaccination or monoclonal antibody administration.

Before the COVID-19 pandemic, respiratory syncytial virus (RSV) infection exhibited a predictable seasonal pattern each year (1). However, following the onset of the COVID-19 pandemic, global changes in RSV epidemiology were reported. Social measures implemented to limit the spread of SARS-CoV-2 also impacted the transmission of RSV, leading to a substantial reduction in RSV cases in the first year of the COVID-19 pandemic (2,3). Subsequently, as public health restrictions were relaxed, off-season resurgences of RSV infection were observed in 2021 (4–6). Some studies also noted a shift in the age distribution of hospitalized RSV patients, with a higher proportion of older children compared to the pre-pandemic period (7,8). As it remains unclear whether RSV infection will return to a seasonal pattern, we aimed to investigate the epidemiological trend of RSV infection from 2018 to 2024, in Saitama Prefecture, Japan.

Data on weekly RSV-related hospitalizations in children under 15 years of age, including age and the number of patients requiring intubation, were collected by the RSV Infection Surveillance Working Group of the Saitama Branch of the Japanese Pediatric Society. Twenty-two hospitals participated in the surveillance, encompassing nearly all facilities with pediatric wards in Saitama Prefecture. The numbers of children (0–14 years) in Saitama Prefecture were 0.92 million (2018), 0.91 million (2019), 0.90 million (2020), 0.89 million (2021), 0.88 million (2022), 0.86 million (2023), and 0.84 million (2024). RSV infection was diagnosed based on clinical presentation and laboratory findings. The average admissions per hospital per week and the percentage of patients aged ≥2 years were compared from 2018 to 2024. We focused on children aged ≥2 years because most children experience their first RSV infection by age 2 and the first episode is typically the most severe; consequently, RSV-related hospitalizations are concentrated among children <2 years (9). Because prior infection status was unavailable in our dataset, examining admissions among children ≥2 years may indicate shifts in age at primary RSV infection. Analysis of variance (ANOVA) was used to compare average weekly admission rates between years. Due to an extremely low number of admissions in 2020, data from this year were excluded only from the analysis of average weekly admission rates. Data from 2020 were

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Table 1. Number of inpatients, age distribution and inpatients who required intubation in Saitama from 2018 to 2024

	2018	2019	2020	2021	2022	2023	2024
Number of inpatients	1526	1496	161	1350	1006	1349	1183
Age 0 year, *n* (%)	897 (58.8)	773 (51.7)	91 (56.5)	649 (48.0)	495 (49.2)	697 (52.6)	656 (55.5)
Age 1 year, *n* (%)	353 (23.1)	426 (28.5)	30 (18.6)	298 (22.0)	206 (20.5)	284 (21.0)	276 (23.3)
Age ≥ 2 years, *n* (%)	276 (18.1)	297 (19.9)	40 (24.8)	406 (30.1)	305 (30.3)	365 (27.1)	251 (21.2)
Intubated patients, *n* (%)	31 (2.0)	30 (2.0)	4 (2.5)	39 (2.9)	27 (2.7)	41 (3.0)	41 (3.5)

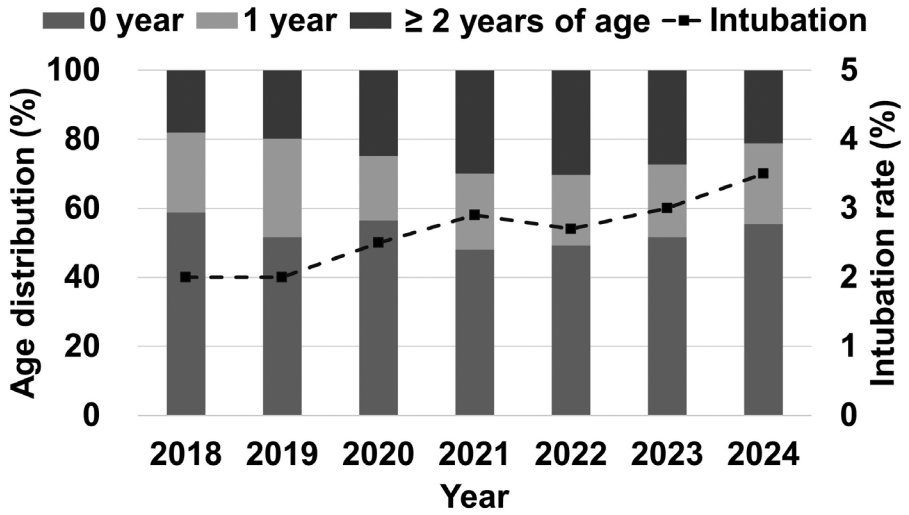


Fig. 1. Annual proportions of hospitalized patients aged ≥2 years and of those requiring intubation from 2018 to 2024. In terms of the proportions of patients aged ≥2 years, logistic regression revealed a significant negative coefficient for the quadratic term of year ($p < 0.001$). Intubation rates did not differ significantly across the seven years ($p = 0.181$).

included in all other analyses. To evaluate the temporal trend in the proportion of hospitalized patients aged ≥2 years with RSV infection, we performed a logistic regression analysis using the number of patients aged ≥2 years as the numerator and the total number of hospitalized patients as the denominator. Year was included as a continuous independent variable, along with a quadratic term to assess non-linear trends over time. Fisher's exact test was used to compare the intubation rate by year. Statistical significance was defined as $p < 0.05$. Analyses were performed using R software, version 4.4.2 (R Foundation for Statistical Computing, Vienna, Austria). As this study utilized publicly available surveillance data without involving individual-level information or direct interaction with patients, ethical approval was not required, in accordance with national and institutional guidelines.

The total number of reported hospitalized RSV patients was as follows: 1,526 in 2018, 1,496 in 2019, 161 in 2020, 1,353 in 2021, 1,006 in 2022, 1,350 in 2023, and 1,183 in 2024 (Table 1).

There was no significant difference in mean weekly admission rates among 2018, 2019, 2021, 2022, 2023, and 2024 ($p = 0.601$). The proportions of patients aged ≥2 years were 18.1% in 2018, 19.9% in 2019, 24.8% in 2020, 30.1% in 2021, 30.3% in 2022, 27.3% in 2023, and 21.2% in 2024 (Table 1 and Fig. 1). Logistic regression revealed a significant negative coefficient for the quadratic term of year ($p < 0.001$), indicating a peak in the proportion of RSV hospitalizations among children aged ≥2 years around 2021, followed by subsequent decline. Intubation rates did not differ significantly across the seven years analyzed ($p = 0.181$). The weekly admission rates peaked between epidemiological weeks 30 and 40 in 2018 and 2019 (Fig. 2A). No significant RSV activity was observed in 2020. A sharp and early epidemic wave was seen between weeks 20 and 40 in 2021 (Fig. 2B). Notably, in 2023 and 2024, the season shifted even earlier, with an epidemic wave observed between weeks 10 and 40 (Fig. 2C).

Social restrictions during the COVID-19 pandemic markedly reduced the incidence of RSV infections, as widely reported (6). In our previous study from Saitama, we observed that the 2021 RSV epidemic wave began earlier, in July, and peaked more steeply than in the pre-pandemic years, when peak activity was typically observed between August and October (5). In the present study, we found that RSV activity in the post-pandemic period occurred even earlier, from March to June, suggesting a notable shift in seasonality. This earlier seasonal shift was also observed in national-level sentinel surveillance data from the Infectious Diseases Weekly Report (IDWR) in Japan (10), indicating that the trend in Saitama reflects a broader pattern seen nationwide.

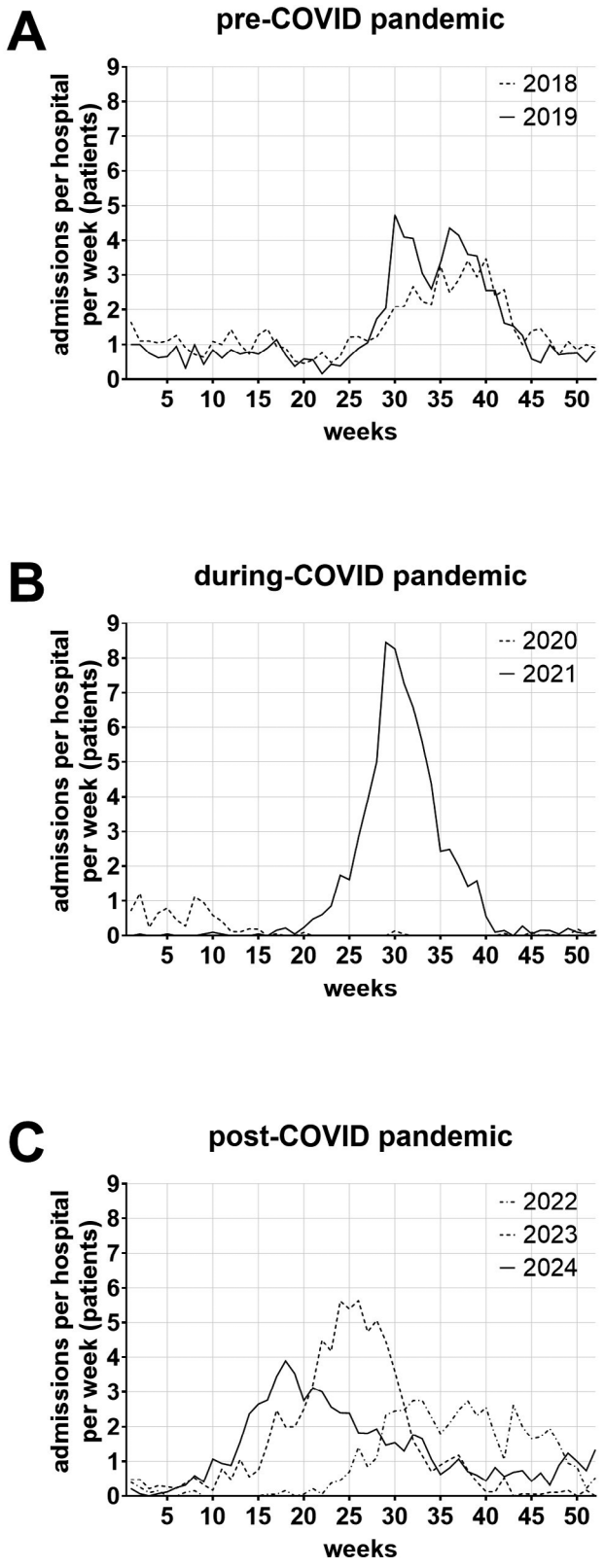


Fig. 2. Average admissions per hospital per week due to RSV infection across the pre-, during-, and post-pandemic periods. Average admissions were calculated as the number of inpatients with respiratory syncytial (RS) virus infection per reporting hospital for each week (weeks 1–52) from 2018 to 2024. (A) Pre-pandemic years (2018–2019). (B) During-pandemic years (2020–2021). (C) Post-pandemic years (2022–2024).

The post-pandemic shift in RSV seasonality appears to vary by country. In the United States, for example, an off-season surge occurred in 2021, but RSV activity has since returned to its usual seasonal pattern (4,11). The reasons behind these inter-country differences remain unclear but may involve variations in climate, public health practices, cultural behaviors, and population immunity.

We also observed changes in the age distribution of hospitalized RSV patients. The proportion of patients aged ≥2 years increased to approximately 30% in 2021 and 2022, compared to less than 20% before the pandemic. This finding is consistent with other reports indicating a higher prevalence of RSV in older children in the post-pandemic period (2,8,12). However, this proportion decreased in 2023 and 2024, suggesting a possible return to the pre-pandemic age distribution as community immunity builds up with ongoing RSV exposure.

Regarding the severity of RSV infection, while some studies have suggested increased disease severity post-pandemic, the findings have been inconsistent (13). In our data, the proportion of intubated patients showed no statistically significant difference through seven years. It seems that severity did not change between pre-pandemic and post-pandemic. Nevertheless, the intubation rate during and after the pandemic trended upward; while not statistically significant, this pattern suggests a possible increase that warrants continued monitoring.

In conclusion, while the seasonality and age distribution of RSV infections have shifted following the COVID-19 pandemic, it remains uncertain whether these changes will persist. The pandemic has disrupted the typical epidemiology of RSV, making it more difficult to predict outbreak timing. Ongoing surveillance will be essential in the coming years to guide preventive strategies and optimize immunization timing.

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Conflict of interest None to declare.

REFERENCES

1. Li Y, Reeves RM, Wang X, et al. RSV Global Epidemiology Network; RESCEU investigators. Global patterns in monthly activity of influenza virus, respiratory syncytial virus, parainfluenza virus, and metapneumovirus: a systematic analysis. Lancet Glob Health. 2019;7:e1031-e1045.
2. Kang Y, Ohnishi T, Yutaka K, et al. Decrease in pediatric inpatients with respiratory syncytial virus infection during severe acute respiratory syndrome coronavirus 2 pandemic. Pediatr Int. 2022;64:e14717.

3. van Summeren J, Meijer A, Aspelund G, et al. Low levels of respiratory syncytial virus activity in Europe during the 2020/21 season: what can we expect in the coming summer and autumn/winter? Euro Surveill. 2021;26:2100639.
4. Hamid S, Winn A, Parikh R, et al. Seasonality of respiratory syncytial virus - United States, 2017-2023. MMWR Morb Mortal Wkly Rep. 2023;72:355-361.
5. Ohnishi T, Kang Y, Kawano Y, et al. An atypical surge in RSV infections among children in Saitama, Japan in 2021. IJID Reg. 2022;7:124-126.
6. Bardsley M, Morbey RA, Hughes HE, et al. Epidemiology of respiratory syncytial virus in children younger than 5 years in England during the COVID-19 pandemic, measured by laboratory, clinical, and syndromic surveillance: a retrospective observational study. Lancet Infect Dis. 2023;23:56-66.
7. Garcia-Maurino C, Brenes-Chacón H, Halabi KC, et al. Trends in age and disease severity in children hospitalized with RSV infection before and during the COVID-19 pandemic. JAMA Pediatr. 2024;178:195-197.
8. Rao S, Armistead I, Messacar K, et al. Shifting epidemiology and severity of respiratory syncytial virus in children during the COVID-19 pandemic. JAMA Pediatr. 2023;177:730-732.
9. Glezen WP, Taber LH, Frank AL, et al. Risk of primary infection and reinfection with respiratory syncytial virus. Am J Dis Child. 1986;140:543-546.
10. Japan Institute for Health Security (JIHS). RSV infection. Available at <https://id-info.jihs.go.jp/surveillance/idwr/jp/graph/weekly/20rsv.html>. Accessed Jan 5, 2025.
11. Jobe NB, Rose E, Winn AK, et al. Human metapneumovirus seasonality and co-circulation with respiratory syncytial virus - United States, 2014-2024. MMWR Morb Mortal Wkly Rep. 2025;74:182-187.
12. Casalegno JS, Ploin D, Cantais A, et al. Characteristics of the delayed respiratory syncytial virus epidemic, 2020/2021, Rhône Loire, France. Euro Surveill. 2021;26:2100630.
13. Maglione M, Tipo V, Barbieri E, et al. Changes in respiratory viruses' activity in children during the COVID-19 pandemic: A systematic review. J Clin Med. 2025;14:1387.