IJID Regions 7 (2023) 124–126

Contents lists available at ScienceDirect

IJID Regions

journal homepage: www.elsevier.com/locate/ijregi

Short Communication

An atypical surge in RSV infections among children in Saitama, Japan in 2021

Takuma Ohnishi [a,b,#,*], Yumi Kang [b,#], Yutaka Kawano [b], Tetsuya Kunikata [c], Ko Ichihashi [d]

[a] Department of Pediatrics, Keio University School of Medicine, 35 Shinanomachi, Shinjuku-ku, Tokyo 160-8582, Japan
[b] Division of Infectious Diseases, Immunology and Allergy, Saitama Children's Medical Center, 1–2 Shintoshin, Chuou-ku, Saitama-shi, Saitama 330-8777, Japan
[c] Division of Neonatal Medicine, Department of Pediatrics, Saitama Medical University Hospital, 38 Morohongo, Moroyamamachi, Iruma-gun, Saitama 350-0495, Japan
[d] Department of Pediatrics, Jichi Medical University Saitama Medical Center, 1–847 Amanuma-cho, Omiya-ku, Saitama-shi, Saitama 330-0834, Japan

A B S T R A C T

Background: In 2021, atypical seasonal respiratory syncytial virus (RSV) outbreaks were observed in several countries. However, the peak, duration, and severity of these outbreaks have not been assessed.
Methods: Data were collected from almost all facilities with pediatric wards in Saitama Prefecture, Japan. Variables included the weekly number of patients admitted with RSV infection, their age, and the number of patients who required intubation. The average weekly admission rates (number of patients admitted divided by the number of hospitals) were compared by pre-pandemic year (2018 and 2019) and 2021, using analysis of variance.
Results: In 2021, 1354 patients were admitted with RSV infection. The median age of the patients was < 12 months. The admission rate peaked around week 30. The slope of the peak in 2021 was markedly steeper than in the previous years. The mean weekly admission rate did not differ significantly between 2018, 2019, and 2021 ($p = 0.77$). The proportions of intubated patients did not differ significantly over the 4 years (2018-2021, $p = 0.68$).
Conclusion: The overall number of RSV admissions and intubation rate in 2021 were similar to those in pre-pandemic years.

Introduction

At the start of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic in 2020, strict measures were implemented to prevent disease transmission, impeding the spread of SARS-CoV-2 and other respiratory viruses, including respiratory syncytial virus (RSV) [1,2]. Subsequently, atypical seasonal RSV outbreaks were observed in several countries, including Japan [3–6]. However, the peak, duration, and severity of the 2021 RSV outbreak have not been assessed. The aim of this study was to compare RSV hospital admissions in 2021 with those in the two years preceding the coronavirus disease 2019 (COVID-19) pandemic.

Methods

The data were collected by the Saitama Branch of the Japanese Pediatric Society's RSV Infection Surveillance Working Group. Variables included the weekly number of patients admitted with RSV infection, their age, and the number of patients who required intubation. RSV infection diagnosis was based on clinical symptoms and laboratory findings. Twenty-two hospitals participated, covering almost all facilities with pediatric wards in the Saitama Prefecture. Saitama Prefecture has a total population of 7.3 million people, including 0.9 million children (< 15 years of age). The average weekly admission rates (number of patients admitted divided by the number of hospitals) were compared by year for 2018, 2019, and 2021, using analysis of variance. Data from 2020 were excluded from the analysis due to the low number of admissions [2]. 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 4.0.3 (R Foundation for Statistical Computing, Vienna, Austria). The study was approved by the Institutional Ethics Committee (No. 2020-05-008).

Results

The number of patients admitted with RSV infection was 1515 in 2018, 1465 in 2019, 157 in 2020, and 1354 in 2021 (Table 1). The median age of the patients was < 12 months throughout the study period. The admission rate peaked between weeks 30 and 40 in 2018 and 2019, and around week 30 in 2021. The slope of the peak in 2021 was markedly steeper than in the previous years (Figure 1). The mean weekly admission rate did not differ significantly between 2018, 2019, and 2021 ($p = 0.77$). The proportion of intubated patients was also similar over the 4 years: 2.2% (33/1515) in 2018, 2.6% (38/1465) in 2019, 2.5% (4/157) in 2020, and 2.9% (39/1354) in 2021 ($p = 0.68$).

* Correspondence: Takuma Ohnishi, Department of Pediatrics, Keio University School of Medicine, 35 Shinanomachi, Shinjuku-ku, Tokyo 160-8582, Japan. Tel: +81-3-3353-1211
E-mail address: prince1999and7@a2.keio.jp (T. Ohnishi).
# Contributed equally as co-first authors

https://doi.org/10.1016/j.ijregi.2022.12.006
Received 21 November 2022; Accepted 16 December 2022
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Table 1
Number of respiratory syncytial virus (RSV) infection admissions by age and year in Saitama Prefecture, 2018–2021

Age/year	Total	0	1	2	3	4	5	6	7	8	9	10	>10
No. of patients in 2018	1515	894	351	140	79	24	9	6	4	1	1	1	5
(%)	(100)	(59.0)	(23.2)	(9.2)	(5.2)	(1.6)	(0.6)	(0.4)	(0.3)	(0.1)	(0.1)	(0.1)	(0.3)
No. of patients in 2019	1465	758	418	170	58	38	13	3	2	0	0	2	3
(%)	(100)	(51.7)	(28.5)	(9.6)	(4.0)	(2.6)	(0.9)	(0.2)	(0.1)	(0.0)	(0.0)	(0.1)	(0.2)
No. of patients in 2020	161	91	30	15	3	9	2	4	3	1	1	0	2
(%)	(100)	(56.5)	(18.6)	(9.3)	(1.9)	(5.6)	(1.2)	(2.5)	(1.9)	(0.6)	(0.6)	(0.0)	(1.2)
No. of patients in 2021	1354	650	300	216	92	55	25	8	3	2	2	1	0
(%)	(100)	(48.0)	(22.2)	(16.0)	(6.8)	(4.1)	(1.8)	(0.6)	(0.2)	(0.1)	(0.1)	(0.1)	(0.0)

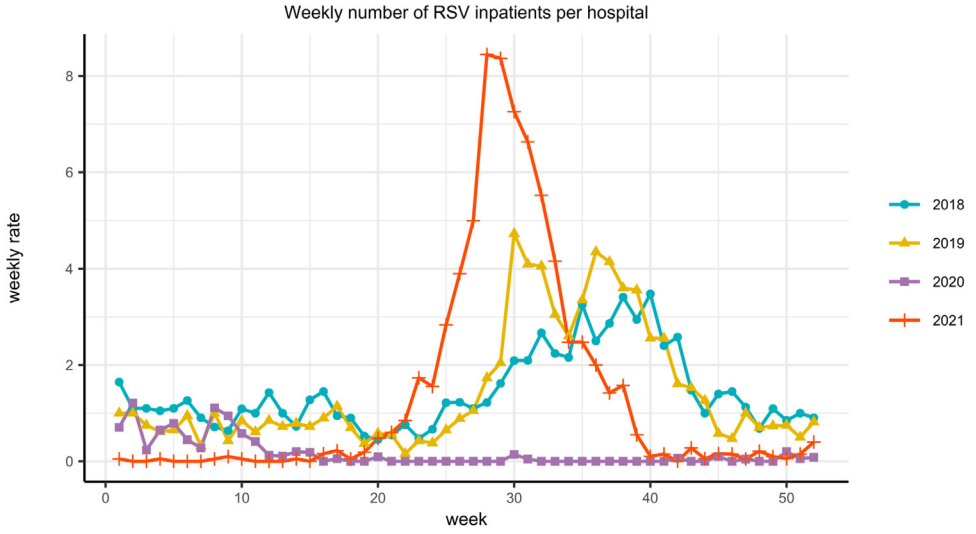


Figure 1. Average number of weekly admissions of pediatric patients with respiratory syncytial virus (RSV) infections per hospital in Saitama Prefecture by year, 2018–2021.

Discussion

There were no RSV outbreaks in 2020; however, an atypical surge was detected in 2021. Although the peak was higher than in previous years, the number of RSV infections decreased sharply following the peak. There were no significant differences between 2018, 2019, and 2021 in the number of patients admitted with RSV infection and no significant difference in the rate of endotracheal intubation by year; hence, it is likely that there was no change in RSV virulence.

There are two possible explanations for the lack of difference between the number of admissions in 2021 and that in 2018 or in 2019. First, infants aged < 5 months are more likely to develop severe disease [7], while older children generally experience relatively mild disease. The reduced RSV incidence in 2020 might have resulted in an increased susceptibility in the population; therefore, potentially causing a larger RSV outbreak to occur in 2021. However, even during the RSV surge, the number of hospitalized patients was comparable to previous years, because the age group at high risk of a severe clinical illness was very similar to that of the previous years.

The other possible explanation is palivizumab — the only available medication for preventing RSV infection [7]. In Japan, palivizumab is administered monthly to high-risk patients during epidemic seasons. During the 2021 season, palivizumab administration started in July. Therefore, high-risk patients were protected against RSV surges.

The total number of RSV infections was not ascertainable; therefore, it was not possible to calculate admission rates. However, during the COVID-19 pandemic, the reluctance of parents and caregivers to risk exposure to SARS-CoV-2 in hospitals resulted in a substantial decrease in access to pediatric care [8]. Conversely, the COVID-19 pandemic could have increased the demand for microbiological diagnosis in patients with respiratory symptoms, resulting in an increased number of tests being processed compared with in previous years. Therefore, focusing on admissions of children with moderate-to-severe infections may have prevented bias caused by physician and caregiver intentions.

In summary, the number of RSV admissions in 2021 was not significantly different from that in 2018 or in 2019, despite an unexpected surge in 2021.

Contributors' statement

Drs Ohnishi and Kang conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript.

Drs Kawano and Kunikata designed the data collection tools, collected data, carried out the initial analyses, and reviewed and revised the manuscript.

Dr Ichihashi coordinated and supervised data collection, and critically reviewed the manuscript for important intellectual content.

All authors have approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Conflicts of interest

The authors have no conflicts of interest to declare.

Acknowledgments

The authors would like to thank the Japanese Pediatric Society Saitama Branch RSV Infection Surveillance Working Group for collecting data. The members are: Yutaka Kawano, MD, PhD, Saitama Children's Medical Center; Shoichi Oyama, MD, Saiseikai Kawaguchi General Hospital; Tetsuya Kunikata, MD, PhD, Saitama Medical University Hospital; Toshihiro Kobayashi, MD, PhD, Kobayashi Clinic; Seiji Sato, MD, PhD, Saitama City Hospital; Hisanori Sobajima, MD, PhD, Saitama Medical University Saitama Medical Center; Shigeharu Hosono, MD,

PhD, Jichi Medical University Saitama Medical Center; Mahito Mine, MD, Mine Pediatrics; and Ko Ichihashi, MD, PhD, Jichi Medical University Saitama Medical Center.

Financial and funding disclosure

This research was supported by a grant from the Japanese Society for Pediatric Infectious Diseases.

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