



Research Article

Temporal changes in pediatric respiratory syncytial virus and adenovirus positivity across COVID-19-related periods: A six-year retrospective cohort study

Yunus Nas ^{a,*} 

^a Department of Pediatrics and Infectious Disease, Hisar Hospital Intercontinental, İstanbul, Türkiye

ABSTRACT

Objective: To describe temporal changes in respiratory syncytial virus (RSV) and adenovirus positivity among children tested across three COVID-19-related periods.

Methods: This single-center retrospective cohort study included 8,253 children aged 0–18 years who underwent concurrent RSV and adenovirus antigen testing for suspected acute respiratory infection from January 2018 through June 2023. Periods were defined as pre-pandemic (January 2018–February 2020), restrictive pandemic (March 2020–May 2021), and post-restriction (June 2021–June 2023). Positivity proportions were compared by period. Unadjusted odds ratios (ORs) were calculated from period-specific counts using the pre-pandemic period as reference.

Results: RSV was detected in 266 children (3.2%) and adenovirus in 612 (7.4%). RSV positivity was 1.5% (55/3,785) pre-pandemic, 1.2% (13/1,055) during restrictions, and 5.8% (198/3,413) post-restriction. Relative to the pre-pandemic period, the odds of RSV positivity did not differ during restrictions (OR 0.85, 95% CI 0.46–1.55) but were higher post-restriction (OR 4.18, 95% CI 3.09–5.65). Adenovirus positivity was 8.8%, 10.2%, and 5.0%, respectively; corresponding ORs were 1.18 (95% CI 0.94–1.48) and 0.54 (95% CI 0.45–0.66).

Conclusion: Among clinically selected children who were tested, RSV and adenovirus positivity followed different temporal patterns. These unadjusted associations should not be interpreted as causal effects of specific public-health measures because seasonality, testing practices, and healthcare-seeking behavior may have differed across periods.

ARTICLE INFO

Article history:

Received – July 14, 2026
Revision requested – August 21, 2026
Revision received – August 24, 2026
Accepted – September 13, 2026

Keywords:

Adenovirus
Child
COVID-19
Respiratory syncytial virus infections
Retrospective studies



This is an open access article distributed under the CC BY licence.

© 2026 by the Author.

Citation: Nas Y. Temporal changes in pediatric respiratory syncytial virus and adenovirus positivity across COVID-19-related periods: A six-year retrospective cohort study. *Chall J Perioper Med.* 2026;4(3):139–143.

1. Introduction

Respiratory viruses are an important source of illness and healthcare use in childhood. Respiratory syncytial virus (RSV) and human adenovirus can cause disease ranging from uncomplicated upper respiratory symptoms to lower respiratory tract infection requiring hospital care. Infants and preschool children carry a particularly high burden because immune defenses are still developing and contact within households and community settings is frequent. Despite marked differences in virol-

ogy and transmission, both pathogens contribute to pediatric respiratory morbidity and seasonal healthcare demand [1,2].

In infants and young children, RSV is a major cause of bronchiolitis and pneumonia. Its circulation in temperate climates was generally seasonal and predictable before 2020. Adenovirus differs in being a non-enveloped DNA virus that may be detected throughout the year, with geographic and type-related variation in seasonality. Clinical manifestations include febrile respiratory illness, pharyngoconjunctival fever, bronchiolitis, and

* Corresponding author. E-mail address: yunus.nas@hisarhospital.com (Y. Nas)

ISSN: 2980-292X / DOI: <https://doi.org/10.20528/cjpm.2026.1268>

pneumonia; severe presentations occur more often in younger or immunocompromised patients [2–5].

The public-health response to COVID-19 changed opportunities for transmission of many respiratory pathogens. During the most restrictive phases, surveillance systems in multiple countries recorded marked reductions in RSV, influenza, and other seasonal infections [6–8]. When mitigation policies were eased, respiratory-virus activity returned, but not uniformly across pathogens. RSV outbreaks were often delayed or displaced from their customary seasons, whereas adenovirus trends were less consistent between regions [9–11].

Most post-pandemic reports have emphasized RSV, and fewer have followed RSV and adenovirus concurrently over an extended interval in one pediatric testing population. We therefore compared positivity for both viruses across pre-pandemic, restrictive pandemic, and post-restriction periods. The analysis was designed to describe temporal associations, not to estimate the causal effect of individual public-health measures.

2. Materials and Methods

This single-center retrospective cohort study examined consecutive pediatric test encounters at an anonymized tertiary hospital in Istanbul, Türkiye. Electronic records were searched for children who underwent concurrent RSV and adenovirus antigen testing from January 2018 through June 2023. This study was approved by the Hisar Hospital Intercontinental Clinical Research Ethics Committee (Approval Number: 23-57; Date: December 1, 2023). The study followed the Declaration of Helsinki. Because anonymized routine-care data were analyzed retrospectively, the requirement for individual informed consent was waived.

Eligible children were aged 0–18 years and were tested during evaluation for suspected acute respiratory infection. When multiple tests occurred within the same illness episode, only the earliest was retained. Invalid assays were excluded. The periods were defined from the verified dataset as pre-pandemic (January 2018–February 2020), restrictive pandemic (March 2020–May 2021), and post-restriction (June 2021–June 2023). The three periods differed in duration and calendar-month composition. All eligible records were included; therefore, no a priori sample-size calculation was performed.

Nasopharyngeal samples were obtained during routine clinical assessment. RSV and adenovirus antigens were tested simultaneously using a commercial rapid immunochromatographic assay according to the manufacturer's protocol. Each pathogen was reported separately as detected or not detected.

Age, sex, specimen date, RSV result, and adenovirus result were retrieved from the electronic record. Obvious spelling variants in the laboratory export (for example, 'Pozitif' and 'pozitif*') were harmonized with the positive category before analysis. Three children with missing sex were retained in overall and period-specific analyses but excluded from sex-specific comparisons; no imputation was performed. The analytical dataset was de-identified.

Primary outcomes were RSV and adenovirus positivity proportions within each epidemiological period. All denominators comprised children tested because of suspected respiratory infection and do not represent the general pediatric population.

2.1. Statistical analyses

Continuous data are summarized as medians with interquartile ranges and categorical data as counts and percentages. Period comparisons used the Kruskal–Wallis test for age and Pearson's chi-square test for categorical variables. Because the previously reported adjusted model could not be reconciled with the observed counts and its coding could not be independently verified, it was not retained. Instead, period-specific unadjusted ORs and 95% confidence intervals were calculated directly from 2×2 tables, with the pre-pandemic period as reference. These analyses included all 8,253 children because period and virus results were complete. The models did not adjust for age, sex, calendar month, season, or year and are interpreted as descriptive temporal associations. Tests were two-sided; $p < 0.05$ indicated statistical significance. Analyses were conducted using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA).

3. Results

The analysis included 8,253 children tested concurrently for RSV and adenovirus from January 2018 through June 2023 (Fig. 1).

The pre-pandemic, restrictive pandemic, and post-restriction periods included 3,785 (45.9%), 1,055 (12.8%), and 3,413 (41.4%) children, respectively. Three children in the restrictive period had missing sex data (Table 1). Median age differed across periods ($p < 0.001$).

RSV was detected in 266 children (3.2%): 55/3,785 (1.5%) pre-pandemic, 13/1,055 (1.2%) during restrictions, and 198/3,413 (5.8%) post-restriction ($p < 0.001$; Table 2). Adenovirus was detected in 612 children (7.4%): 334/3,785 (8.8%), 108/1,055 (10.2%), and 170/3,413 (5.0%), respectively ($p < 0.001$; Table 3).

Relative to the pre-pandemic period, RSV odds were not significantly different during the restrictive period (OR 0.85, 95% CI 0.46–1.55; $p = 0.590$) but were higher post-restriction (OR 4.18, 95% CI 3.09–5.65; $p < 0.001$). Adenovirus odds were not significantly different during restrictions (OR 1.18, 95% CI 0.94–1.48; $p = 0.159$) and were lower post-restriction (OR 0.54, 95% CI 0.45–0.66; $p < 0.001$; Table 4).

4. Discussion

In this tested pediatric population, RSV and adenovirus positivity followed different patterns across the three COVID-19-related periods. RSV positivity remained low during the first two periods and increased post-restriction. Adenovirus positivity was numerically higher during restrictions but declined post-restriction. The count-derived ORs were consistent with these descriptive proportions.

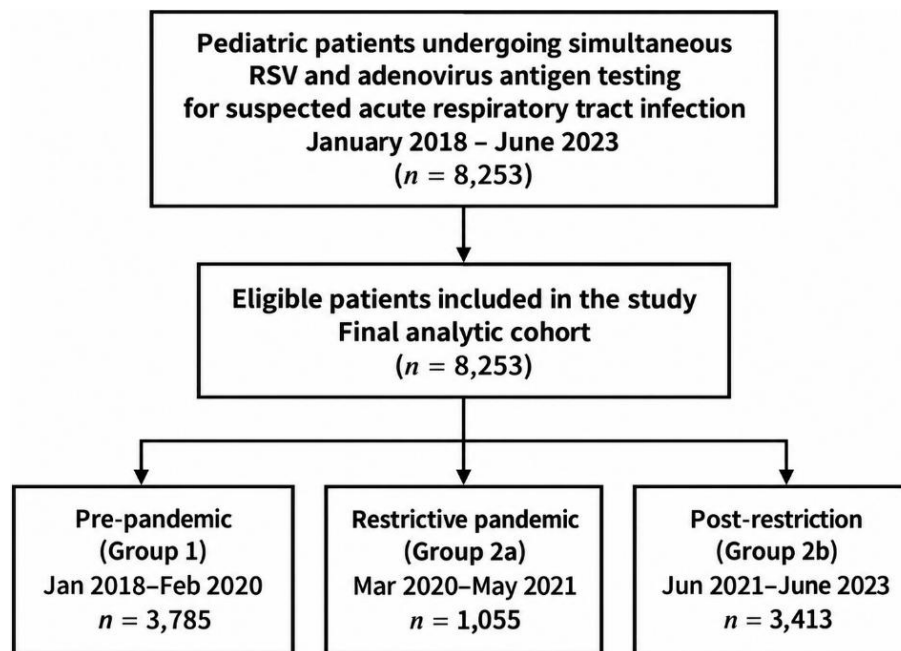


Fig. 1. Flow diagram of patient selection and classification. A total of 8,253 children underwent concurrent RSV and adenovirus antigen testing from January 2018 through June 2023 and were classified as pre-pandemic (January 2018–February 2020; $n = 3,785$), restrictive pandemic (March 2020–May 2021; $n = 1,055$), or post-restriction (June 2021–June 2023; $n = 3,413$).

Table 1. Baseline characteristics according to epidemiological period.

Characteristic	Pre-pandemic ($n = 3,785$)	Restrictive pandemic ($n = 1,055$)	Post-restriction ($n = 3,413$)	p value
Number of children, n (%)	3,785 (45.9)	1,055 (12.8)	3,413 (41.4)	—
Age (years), median (IQR)	2.8 (1.2–5.0)	2.2 (1.0–4.3)	4.0 (1.7–6.4)	< 0.001
Male sex, n (%)	2,078 (54.9)	611 (57.9)	1,902 (55.7)	0.208
Female sex, n (%)	1,707 (45.1)	441 (41.8)	1,511 (44.3)	—
Missing sex, n (%)	0	3 (0.3)	0	—

IQR, interquartile range. Age was compared with the Kruskal–Wallis test; sex with Pearson’s chi-square test. Percentages may not sum to 100 because of rounding.

Table 2. Respiratory syncytial virus positivity according to epidemiological period.

Period	Tested, n	RSV positive, n (%)	RSV negative, n (%)	p value
Pre-pandemic	3,785	55 (1.5)	3,730 (98.5)	—
Restrictive pandemic	1,055	13 (1.2)	1,042 (98.8)	—
Post-restriction	3,413	198 (5.8)	3,215 (94.2)	—
Total	8,253	266 (3.2)	7,987 (96.8)	< 0.001

RSV, respiratory syncytial virus. p value from Pearson’s chi-square test.

Table 3. Adenovirus positivity according to epidemiological period.

Period	Tested, n	Adenovirus positive, n (%)	Adenovirus negative, n (%)	p value
Pre-pandemic	3,785	334 (8.8)	3,451 (91.2)	—
Restrictive pandemic	1,055	108 (10.2)	947 (89.8)	—
Post-restriction	3,413	170 (5.0)	3,243 (95.0)	—
Total	8,253	612 (7.4)	7,641 (92.6)	< 0.001

p value from Pearson’s chi-square test.

Table 4. Unadjusted period-specific odds ratios for virus positivity.

Outcome and period	OR	95% CI	p value
RSV: pre-pandemic	Reference	—	—
RSV: restrictive pandemic	0.85	0.46–1.55	0.590
RSV: post-restriction	4.18	3.09–5.65	< 0.001
Adenovirus: pre-pandemic	Reference	—	—
Adenovirus: restrictive pandemic	1.18	0.94–1.48	0.159
Adenovirus: post-restriction	0.54	0.45–0.66	< 0.001

CI, confidence interval; OR, odds ratio; RSV, respiratory syncytial virus. Estimates were calculated directly from period-specific 2×2 tables and were not adjusted for age, sex, month, season, or year.

The post-restriction increase in RSV is consistent with reports of delayed or off-season RSV activity after relaxation of COVID-19-related restrictions [5–7]. Reduced exposure during periods of limited social contact may have increased the number of susceptible children, while resumption of school and childcare contacts may have facilitated transmission [7,8]. These mechanisms are plausible but were not measured directly in this study.

Adenovirus showed a different pattern. Environmental durability, prolonged shedding, and multiple routes of transmission may contribute to its heterogeneous temporal behavior [11,12]. Nevertheless, because the analysis did not account for calendar month or season, differences in seasonal composition between periods could partly or substantially explain the observed associations.

The denominator requires particular caution. Participants were children selected for testing because of suspected acute respiratory infection, not a population-based sample. Pandemic-related changes in referral patterns, healthcare-seeking behavior, test availability, or clinicians' thresholds for requesting antigen testing may have changed both the composition and number of children tested. Consequently, positivity proportions cannot be interpreted directly as population incidence or virus circulation.

Strengths include the large dataset and concurrent evaluation of both viruses within one center. Limitations include the retrospective single-center design, use of antigen rather than molecular assays, unequal period duration and month composition, lack of adjustment for season or calendar year, and absence of information on symptoms, severity, comorbidity, admission, viral genotype, and changing testing practices. Residual seasonal and secular confounding is therefore likely. The findings indicate temporal associations only and should not be interpreted as causal effects of specific public-health measures.

5. Conclusions

Among children selected for concurrent antigen testing, RSV positivity increased and adenovirus positivity decreased in the post-restriction period relative to the pre-pandemic period. Because the periods differed in seasonality, duration, testing context, and healthcare-seeking conditions, these findings are descriptive tem-

poral associations rather than evidence that particular public-health measures caused the changes. Multicenter analyses incorporating calendar month, season, year, and testing indications are needed.

Acknowledgements

None declared.

Funding

The author received no financial support for the research, authorship, and/or publication of this manuscript.

Conflict of Interest

The author declares no potential conflicts of interest with respect to the research, authorship, and/or publication of this manuscript.

Data Availability

The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author upon reasonable request.

AI Assistance

During the preparation of this manuscript, ChatGPT was used exclusively for language editing and stylistic refinement. It was not used for statistical analyses or scientific interpretation. The author reviewed and approved the final manuscript and takes full responsibility for its content, accuracy, and conclusions.

Ethics Approval and Consent to Participate

This study was approved by the Hissar Hospital Intercontinental Clinical Research Ethics Committee (Approval Number: 23-57; Date: December 1, 2023). The study followed the Declaration of Helsinki. Because anonymized routine-care data were analyzed retrospectively, the requirement for individual informed consent was waived.

Author Contributions

Yunus Nas: conceptualization, data curation, formal analysis, investigation, methodology, project administration, resources, supervision, validation, visualization, writing – original draft, writing – review and editing.

REFERENCES

- Olsen SJ, Azziz-Baumgartner E, Budd AP, Brammer L, Sullivan S, Pineda RF, et al. Decreased influenza activity during the COVID-19 pandemic—United States, Australia, Chile, and South Africa, 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69(37):1305-9. <https://doi.org/10.15585/mmwr.mm6937a6>

2. Sullivan SG, Carlson S, Cheng AC, Chilver MB, Dwyer DE, Irwin M, et al. Where has all the influenza gone? The impact of COVID-19 on the circulation of influenza and other respiratory viruses, Australia, March to September 2020. *Euro Surveill.* 2020;25(47):2001847. <https://doi.org/10.2807/1560-7917.ES.2020.25.47.2001847>
3. Huh K, Jung J, Hong J, Kim M, Ahn JG, Kim JH, et al. Impact of nonpharmaceutical interventions on the incidence of respiratory infections during the coronavirus disease 2019 (COVID-19) outbreak in Korea: a nationwide surveillance study. *Clin Infect Dis.* 2021;72(7):e184-91. <https://doi.org/10.1093/cid/ciaa1682>
4. Tempia S, Walaza S, Bhiman JN, McMorrough ML, Moyes J, Mkhencele T, et al. Decline of influenza and respiratory syncytial virus detection in facility-based surveillance during the COVID-19 pandemic, South Africa, January to October 2020. *Euro Surveill.* 2021;26(29):2001600. <https://doi.org/10.2807/1560-7917.ES.2021.26.29.2001600>
5. Foley DA, Yeoh DK, Minney-Smith CA, Martin AC, Mace AO, Sikazwe CT, et al. The interseasonal resurgence of respiratory syncytial virus in Australian children following the reduction of coronavirus disease 2019-related public health measures. *Clin Infect Dis.* 2021;73(9):e2829-30. <https://doi.org/10.1093/cid/ciaa1906>
6. Agha R, Avner JR. Delayed seasonal RSV surge observed during the COVID-19 pandemic. *Pediatrics.* 2021;148(3):e2021052089. <https://doi.org/10.1542/peds.2021-052089>
7. Bardsley M, Morbey RA, Hughes HE, Beck CR, Watson CH, Zhao H, 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(1):56–66. [https://doi.org/10.1016/S1473-3099\(22\)00525-4](https://doi.org/10.1016/S1473-3099(22)00525-4)
8. Baker RE, Park SW, Yang W, Vecchi GA, Metcalf CJE, Grenfell BT. The impact of COVID-19 nonpharmaceutical interventions on the future dynamics of endemic infections. *Proc Natl Acad Sci U S A.* 2020;117(48):30547–53. <https://doi.org/10.1073/pnas.2013182117>
9. Li Y, Wang X, Blau DM, Caballero MT, Feikin DR, Gill CJ, et al. Global, regional, and national disease burden estimates of acute lower respiratory infections due to respiratory syncytial virus in children younger than 5 years in 2019: a systematic analysis. *Lancet.* 2022;399(10340):2047–64. [https://doi.org/10.1016/S0140-6736\(22\)00478-0](https://doi.org/10.1016/S0140-6736(22)00478-0)
10. Hall CB, Weinberg GA, Blumkin AK, Edwards KM, Staat MA, Schultz AF, et al. Respiratory syncytial virus-associated hospitalizations among children less than 24 months of age. *Pediatrics.* 2013;132(2):e341-8. <https://doi.org/10.1542/peds.2013-0303>
11. Lynch JP 3rd, Fishbein M, Echavarria M. Adenovirus. *Semin Respir Crit Care Med.* 2011;32(4):494-511. <https://doi.org/10.1055/s-0031-1283287>
12. Echavarría M. Adenoviruses in immunocompromised hosts. *Clin Microbiol Rev.* 2008;21(4):704-15. <https://doi.org/10.1128/CMR.00052-07>