

## LETTER TO THE EDITOR

# New pediatric leukemia/lymphoma diagnoses during the COVID-19 pandemic: A New York perspective

To the Editor:

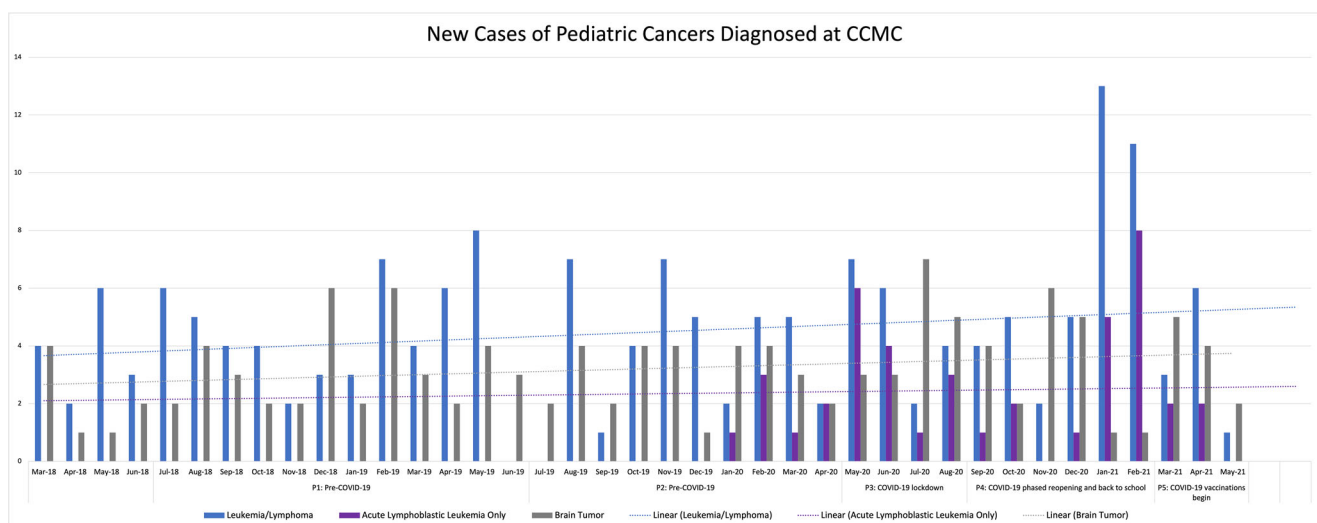
Early life infections, specifically viruses, contribute to the development of pediatric hematologic cancers.<sup>1,2</sup> The emergence of coronavirus disease 2019 (COVID-19) raised concern that this virus could have increased the incidence of leukemia and lymphoma; however, several pediatric oncology centers reported decreased cancer diagnoses during the initial phase of the pandemic, similar to what was seen during the severe acute respiratory syndrome (SARS) epidemic in Hong Kong in 2003.<sup>3-6</sup> There are several theories for decreases in number of new cases, including reduced access to primary care, delays in seeking emergency or subspecialty services, and decreased exposure to seasonal viruses that contribute to the two-hit hypothesis of pediatric cancer, namely acute lymphoblastic leukemia.<sup>2,7</sup> There are few reports of pediatric centers with stable or increased rates of new oncologic diagnoses during the COVID-19 pandemic.<sup>8,9</sup>

A retrospective chart review was conducted of patients diagnosed with nonrelapsed leukemia or lymphoma at Cohen Children's Medical Center (CCMC) from March 2018 until May 2021. CCMC is one of the tertiary care pediatric hospitals in the area with a catchment that includes New York City and the surrounding suburbs. New brain tumor diagnoses were used as a comparison group, as there is not thought to be a seasonal variation.<sup>10</sup> For analysis, the study period was divided into five sections: Pre-COVID-19 #1 03/2018-02/2019, Pre-COVID-19 #2 03/2019-02/2020, COVID-19 lockdown 03/2020-

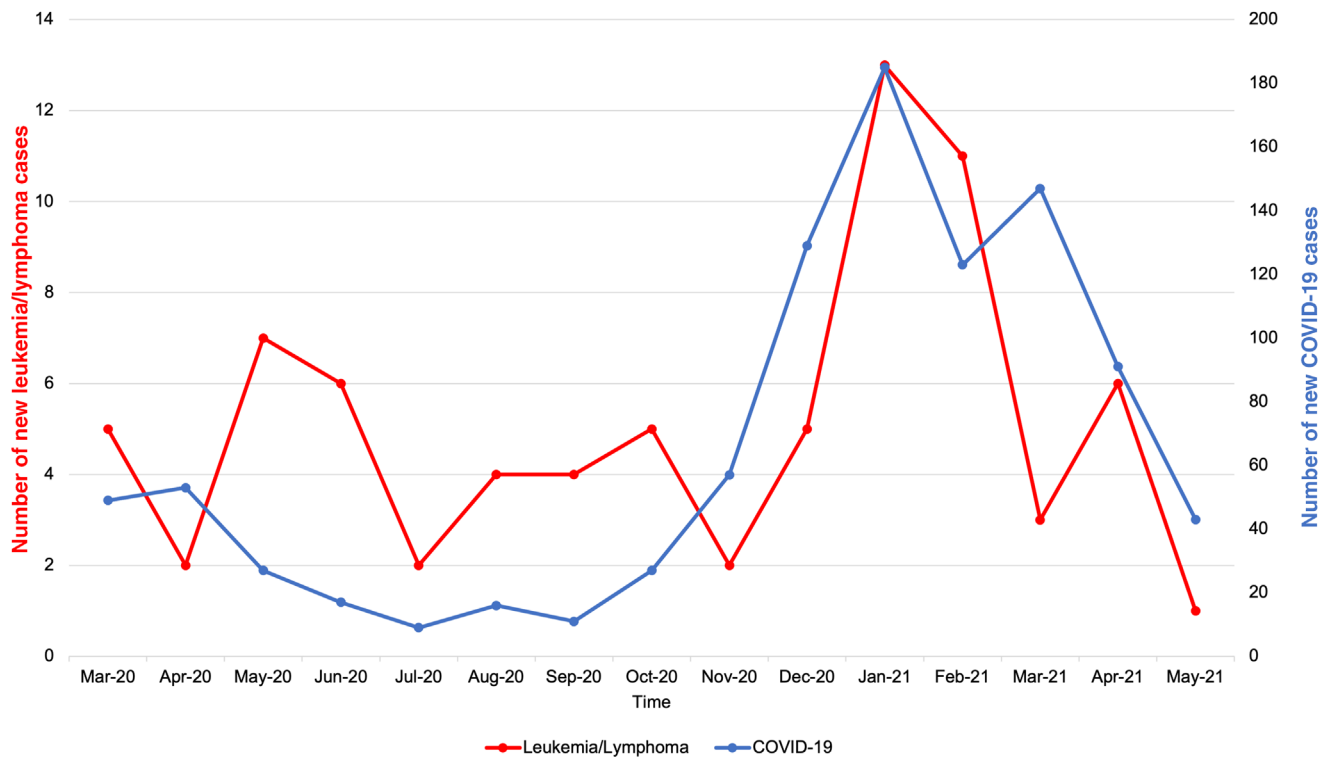
07/2020, COVID-19 phased reopening and back to school 08/2020-12/2020, and COVID-19 vaccinations begin 01/2021-05/2021. New leukemia/lymphoma and brain tumor cases per month by period are displayed in Figure 1.

The statistical methods are provided as Supporting Information. The mean new leukemia/lymphoma within each period ranged from 4.1 (SD = 1.62) to 6.8 (SD = 5.12) per month. No statistically significant difference in proportion of cases was observed among months or periods in leukemia/lymphoma diagnosis when examining: the monthly cases in the 24 pre-COVID-19 months, the period cases in the two pre-COVID-19 periods, or the monthly cases in the 39 months of all pre-COVID-19/COVID-19 periods combined. No statistically significant differences from the expected proportion of cases were observed among the five periods when all periods were examined together. Additionally, this held true for new brain tumor diagnoses. The frequency of new leukemia/lymphoma diagnoses during the COVID-19 periods is displayed in Figure 2, which resembles the CCMC data regarding new COVID-19 diagnoses also displayed. The rate of other common respiratory infections demonstrated the expected seasonal variation in the pre-COVID-19 periods followed by a marked decrease in March 2020 (Figure S1).

These data demonstrate that the number of new diagnoses of pediatric leukemia and lymphoma at our institution remained constant during the COVID-19 pandemic from March 2020 through May 2021.



**FIGURE 1** Number of new leukemia/lymphoma cases (left) and number of new coronavirus disease 2019 (COVID-19) cases (right) versus time



**FIGURE 2** Number of new leukemia/lymphoma cases (left) and number of new COVID-19 cases (right) versus time

This is not reflective of increased referrals as brain tumor diagnosis rates remained stable. The age range of patients accepted to the pediatric department did not change at our institution. Additionally, during the COVID-19 periods, the rates of other respiratory viral infections were remarkably low, excluding other viral infectious triggers in maintaining blood cancer incidence. We extended our time period of interest to detect delayed diagnoses due to lack of primary care as reported in other studies.<sup>11,12</sup>

Despite examining 15 months during the COVID-19 pandemic, we did not see a statistically significant decrease in monthly cases. Rather, cases remained constant as compared to pre-COVID-19 periods. The data from this single-center study would indicate that, despite decreases in other likely leukemia/lymphoma-inciting infections, hematologic cancer rates remained constant. This warrants further study at a multi-institutional level to investigate the association between COVID-19 and pediatric leukemia and lymphoma.

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#### CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

#### FUNDING INFORMATION

No funding was received for this study.

#### AUTHOR CONTRIBUTIONS

Layne J. Silver and Pooja Desai conceptualized and designed the study, collected data, drafted the initial manuscript, and reviewed and revised the manuscript. Julie Krystal, Matthew Taylor, and Kristina Murphy conceptualized and designed the study, and reviewed and revised the manuscript. Sareen Shah designed the data collection instruments, coordinated and supervised data collection, and reviewed and revised the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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#### REFERENCES

1. Bartenhagen C, Fischer U, Korn K, et al. Infection as a cause of childhood leukemia: virus detection employing whole genome sequencing. *Haematologica*. 2017;102(5):e179-e183. <https://doi.org/10.3324/haematol.2016.155382>
2. Greaves M. A causal mechanism for childhood acute lymphoblastic leukaemia [published correction appears in *Nat Rev Cancer*. 2018 May 30]. *Nat Rev Cancer*. 2018;18(8):471-484. <https://doi.org/10.1038/s41568-018-0015-6>
3. Li CK, Zee B, Lee J, Chik KW, Ha SY, Lee V. Impact of SARS on development of childhood acute lymphoblastic leukaemia. *Leukemia*. 2007;21(7):1353-1356. <https://doi.org/10.1038/sj.leu.2404729>
4. Jarvis KB, Lind A, LeBlanc M, Ruud E. Observed reduction in the diagnosis of acute lymphoblastic leukaemia in children during the COVID-19 pandemic. *Acta Paediatr*. 2021;110(2):596-597.
5. Ferrari A, Zecca M, Rizzari C, et al. Children with cancer in the time of COVID-19: an 8-week report from the six pediatric onco-hematology centers in Lombardia, Italy. *Pediatr Blood Cancer*. 2020;67(8):e28410. <https://doi.org/10.1002/psc.28410>
6. Kutluk MT, Ahmed F, Kirazlı M, et al. The effect of the COVID-19 pandemic on paediatric cancer care: lessons learnt from a major paediatric oncology department in Turkey. *Ecancermedicalscience*. 2021;15:1172. <https://doi.org/10.3332/ecancer.2021.1172>
7. Shim KS, Kim MH, Shim CN, et al. Seasonal trends of diagnosis of childhood malignant diseases and viral prevalence in South Korea. *Cancer Epidemiol*. 2017;51:118-124. <https://doi.org/10.1016/j.canep.2017.11.003>
8. Erdmann F, Wellbrock M, Trübenbach C, et al. Impact of the COVID-19 pandemic on incidence, time of diagnosis and delivery of healthcare among paediatric oncology patients in Germany in 2020: evidence from the German Childhood Cancer Registry and a qualitative survey. *Lancet Reg Health Eur*. 2021;9:100188. <https://doi.org/10.1016/j.lanepe.2021.100188>
9. Pelland-Marcotte MC, Xie L, Barber R, et al. Incidence of childhood cancer in Canada during the COVID-19 pandemic. *CMAJ*. 2021;193(47):E1798-E1806. <https://doi.org/10.1503/cmaj.210659>
10. Nurullah R, Kuhle S, Maguire B, Kulkarni K. Seasonality in pediatric cancer. *Indian J Pediatr*. 2018;85(9):785-787. <https://doi.org/10.1007/s12098-017-2561-4>
11. Cox JA, Karlson CW, Dillard BC. Impact of COVID-19 pandemic on timing of childhood cancer diagnoses. *J Pediatr Hematol Oncol*. 2021;43(8):e1244-e1246. <https://doi.org/10.1097/MPH.0000000000002199>
12. Ding YY, Ramakrishna S, Long AH, et al. Delayed cancer diagnoses and high mortality in children during the COVID-19 pandemic. *Pediatr Blood Cancer*. 2020;67(9):e28427. <https://doi.org/10.1002/psc.28427>

#### SUPPORTING INFORMATION

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