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COVID-19 in Children With Cancer in New York City

Data on the prevalence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in children,[1-4] and in children with cancer specifically have been limited. Less than 1% of cases reported from China were in children younger than 10 years.[3] The MSK Kids pediatric program at Memorial Sloan Kettering Cancer Center (MSK) is one of the largest pediatric cancer programs in the US. Starting in mid-March, 2020, we instituted a screening and testing plan to mitigate risk associated with coronavirus disease 2019 (COVID-19).

Methods | On presentation for outpatient or inpatient care, patients were screened for the presence of symptoms of COVID-19 or exposure to contacts with known SARS-CoV-2 infection. We also instituted testing for SARS-CoV-2 using a RT-PCR assay for 3 cohorts of individuals: (1) patients exposed to COVID-19 (screen positive) or with symptoms of infection (symptom positive); (2) asymptomatic patients (symptom negative) prior to deep sedation, myelosuppressive chemotherapy, or admission to the hospital; and (3) caregivers accompanying patients for admission or multiday outpatient chemotherapy. Data for this report were gathered a retrospective research protocol approved by the MSK institutional review board with waiver of informed consent owing to the retrospective and deidentified nature of the data used. Groups were compared using a 2-tailed Fisher exact test.

Results | Between March 10 and April 12, 2020, a total of 335 tests for SARS-CoV-2 were performed on pediatric patients and their caregivers (**Table 1**). Of the 178 unique pediatric patients (107 male and 71 female) tested (mean [SD] age 11.1 [8.5] years), 20 (11.2%) had positive test results (mean [SD] age 15.9 [6.6] years). Of patients specifically tested for positive screening or symptoms (screen positive or symptom positive), the rate of positivity for SARS-CoV-2 was 29.3%. By comparison, in the 120 asymptomatic patients without known exposure (screen negative and symptom negative) the rate of SARS-CoV-2 positivity was only 2.5% (29.3%; 95% CI, 18.1%-42.7% versus 2.5%; 95% CI, 0.5%-7.1%; $P < .001$) (Table 1). Of the 20 patients who tested positive for SARS-CoV-2, only 3 were female (**Table 2**), a significant sex skewing when compared with pediatric patients who tested negative (15%; 95% CI, 3%-38% vs 43%; 95% CI, 35%-51%; $P = .02$).

Only 1 patient with COVID-19 illness required noncritical care hospitalization for COVID-19 symptoms. Three other patients without significant COVID-19 symptoms were admitted for concomitant fever and neutropenia, cancer morbidity, or planned chemotherapy. All other pediatric patients had mild symptoms and were managed at home.

Table 1. Results of COVID-19 Testing at Memorial Sloan Kettering (MSK)

Variable	No.	SARS-CoV-2 positive, No. (%)
March 10-April 12, 2020		
Total pediatric outpatient visits	1267	
Total unique patients	505	
Total pediatric patients swabs	244	25 (10.2)
Total pediatric unique patients	178	20 (11.2)
Total unique patients screen positive or symptom positive	58	17 (29.3)[a]
Total unique patients screen negative and symptom negative	120	3 (2.5)[a]
Total adult caregiver swabs	91	15 (16.5)
Total unique adult caregivers	74	13 (17.6)
Total unique caregivers screen positive or symptom positive	6	3 (50.0)
Total adult caregivers screen negative and symptom negative	68	10 (14.7)
Total patients tested at MSK, April 12, 2020	2932	608 (20.7)

Abbreviation: COVID-19, coronavirus disease 2019.

[a] $P<.001$, Fisher exact test comparing [screen positive or symptom positive] to [screen negative and symptom negative].

Table 2. Sex Distribution in Pediatric Cohort

Variable	Male	Female	*P* value
All pediatric patients tested	107	71	
Pediatric patients screen positive or symptom positive	34	24	.87
Pediatric patients screen negative and symptom negative	73	47	
SARS-CoV-2 positive	17	3	.02[a]

[a] Fisher exact test comparing SARS-CoV-2–positive with SARS-CoV-2–negative groups.

We also instituted testing of adult caregivers of patients (Table 1). Of the 74 individuals tested, 13 caregivers (17.6%) of 10 patients tested positive for SARS-CoV-2. Notably among 68 asymptomatic and unexposed caregivers (screen negative and symptom negative), 10 tested positive for SARS-CoV-2 (14.7%). Simultaneous detection of virus in patient and caregiver was found in 5 patient/caregiver dyads, whereas 5 patients were negative for virus despite close exposure to caregivers with COVID-19.

Discussion | Although this report is limited by small numbers, the data show that (1) the overall morbidity of COVID-19 in pediatric patients with cancer is low with only 5% requiring hospitalization for symptoms of COVID-19; (2) that the rate of SARS-CoV-2 infection among asymptomatic pediatric patients is very low; (3) that unrecognized SARS-CoV-2 infection in asymptomatic caregivers is a major infection control consideration; and (4) that consistent with the sex difference previously seen in adults with critical disease,[5] there is a male bias in SARS-CoV-2 infections in children, suggesting a biological basis in skewed infectivity.

This report suggests that pediatric patients with cancer may not be more vulnerable than other children[2-4] to infection or

morbidity resulting from SARS-CoV-2. Although the asymptomatic SARS-CoV carrier rate in children in the general population is not known, our testing of 120 asymptomatic pediatric patients with cancer revealed only a 2.5% rate of SARS-CoV-2 positivity. By comparison, we observed a 14.7% rate of SARS-CoV-2 positivity in their asymptomatic caregivers (2.5%; 95% CI, 0.5%-7.1% vs 14.7%; 95% CI, 7.3%-25.4%; $P = .002$), which closely matches the asymptomatic carrier rate in pregnant women in New York (13.5%).[6] Together, our results do not support the conjecture that children are a reservoir of unrecognized SARS-CoV-2 infection.

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Presymptomatic Awareness of Germline Pathogenic *BRCA* Variants and Associated Outcomes in Women With Breast Cancer

Individuals who carry pathogenic *BRCA* variants are often identified only after a cancer diagnosis because about half of these persons lack relevant family history (FH),[1] and *BRCA* screening is not routinely performed. Unaffected carriers of pathogenic variants unaware of their genetic status cannot undertake recommended surveillance and prevention measures, including risk-reduction bilateral mastectomy (RRBM), which reduces breast cancer risk in carriers of pathogenic *BRCA* variants[2] and overall mortality in *BRCA1* carriers.[3] However, worldwide, most carriers decline RRBM.[4] We hypothesized that among carriers who decline RRBM and ultimately develop breast cancer, knowing their *BRCA* status before cancer diagnosis might lead to breast cancer downstaging at diagnosis and measurable downstream benefits.

Methods | We performed a single-institution retrospective review of a cohort of *BRCA1*/*BRCA2* carriers diagnosed with breast cancer (2005-2016). All received guideline-based surveillance and prevention recommendations, including RRBM and risk-reduction salpingo-oophorectomy.[5] Demographic, clinical, and pathological data were extracted from medical records, and vital status from the Israel National Cancer Registry. The *t* test was used for continuous variables, and χ^2 for categorical variables. Logistic regression was used for multivariate analyses. Kaplan-Meier survival analysis was performed, with the log-rank test to examine differences between survival curves. Hazard ratios were calculated using Cox regression. All *P* values are 2-sided with 95% CIs. The study was approved by the Shaare Zedek Medical Center institutional review board, waiving patient written informed consent for deidentified data.

Results | Of the 105 women *BRCA* pathogenic variant carriers diagnosed with breast cancer, 83% were Ashkenazi Jewish, mean (SD) age, 50.4 (13.3) years. Of these, 42 were aware of their genotype before diagnosis (*BRCA*-preDx carriers) and 63 only after diagnosis (*BRCA*-postDx carriers) (**Table**). The *BRCA*-preDx carriers had significantly more suggestive FH and higher socioeconomic index (SI) than *BRCA*-postDx carriers (Table). Forty of the 42 *BRCA*-preDx carriers were followed up at the institutional high-risk clinic. Mean age at diagnosis was identical in both groups (50.4 years), but *BRCA*-preDx carriers were significantly more likely to be diagnosed by magnetic resonance imaging and to present with ductal carcinoma in situ (noninvasive disease) or lower-stage invasive disease (Table). There were no significant differences in grade, hormone receptor, or *ERBB2* (formerly *HER2*) expression (Table). *BRCA*-preDx carriers also had significantly lower rates of axillary dissection and chemotherapy delivery, with none requiring neoadjuvant chemotherapy (Table). Despite their earlier-stage disease, most *BRCA*-preDx carriers elected bilateral mastectomy as first surgery, significantly more than *BRCA*-postDx carriers (Table). Logistic regression controlling for age, SI, calendar year at diagnosis, FH, and variant gene indicated that timing of carrier status identification significantly