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Breakthrough SARS-CoV-2 Infection and COVID-19 Disease Severity in Lung Cancer Patients

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BACKGROUND

Patients with Lung Cancer (LC) are at higher risk of having complications from SARS-CoV-2 infection. Multiple studies showed that patients with solid tumors generally mount similar levels of antibodies after SARS-CoV-2 vaccination compared to healthy controls, yet the longitudinal outcomes and breakthrough infection rates remain unclear.

METHODS

The COVID-19 diagnosis (PCR confirmed or patient reported) of LC patients was extracted from the ongoing study of SARS-CoV-2 and Lung Cancer at Mount Sinai Hospital (MSH), New York, USA between March 2020 and September 2022. Clinical information regarding COVID-19 vaccination status, and

course of infection were collected and analyzed (Table 1). Severe COVID-19 disease was defined as hospitalization.

Category	Cases	%
Hospitalization	10	14%
Fever	8	11%
SOB	7	10%
Pneumonia	2	3%
Steroids	7	10%
Oxygen	6	8%
MOAB	6	8%
Antivirals	6	8%
Anticoagulants	1	1%

Table 1. COVID-19 disease course (symptoms, treatment, and hospitalization)

Overall, 21.5% of LC patients (n=65) among 302 LC patients in our study were diagnosed with COVID-19, with 6 patients and 1 patient reporting two and three instances for a total of 73 infections. The mean age was 65.6±10.9 years. 63.1% of patients had stage 4 LC and the majority of patients (55/65) were receiving anti-cancer treatment. 95% of patients were vaccinated with primary doses (2 doses of mRNA-1273 or BNT162b2 vaccine, or 1 dose of Ad26.COV2.S); only 52% of patients completed the first booster vaccination (Figure 1 and Table 2).

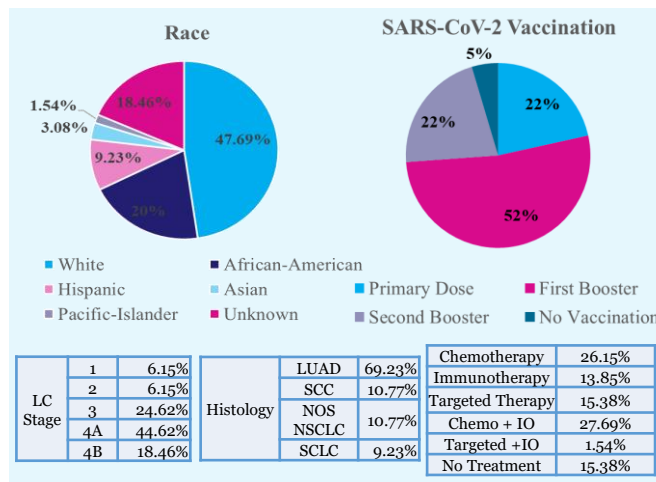


Figure 1. Demographics of Lung Cancer Patients: Race (left) and Vaccination Status (right)
Table 2. Lung Cancer Clinical Characteristics: Stage(left), Histology (middle), and anti-cancer treatment (right)

RESULTS

Among the total of 73 cases of COVID-19 diagnosis, 65.8% (n=48) were breakthrough infections, with a prevalence of 16.4% (46 patients with 48 breakthrough cases among 280 fully vaccinated LC patients). 24 cases occurred in December 2021 to January 2022 and 11 cases in April to May 2022, corresponding to Omicron variant surge periods. 10 cases (13.7%) were severe COVID-19 illnesses requiring hospitalization, 5 of which were breakthrough infections representing 1.8% (5 patients among 280 fully vaccinated LC patients) (Figure 2). Disease severity risk reduction ratio was 0.53 before and after completion of primary doses (5/25, 20% vs 6/57 10.5%) and 0.81 of first booster (7/48, 14.6% vs 4/34, 11.8%) (Figure 2).

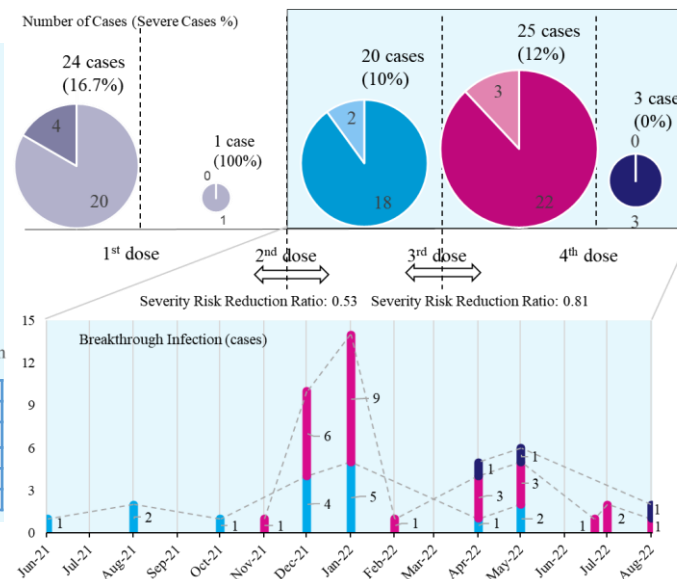


Figure 2. COVID-19 disease in LC Patients with effect size (size of pie chart) and severe case (%) by vaccination status (top) and Breakthrough COVID-19 Infection by timeline (bottom)

CONCLUSIONS

LC patients had similar breakthrough COVID-19 infection rates and higher hospitalization rates compared to the New York State general population*, thus requiring further longitudinal investigation of immunity to SARS-CoV-2 in this population.

*16.6% Breakthrough infection and 0.57% hospitalization with COVID-19 in the population of fully vaccinated people 5-years or older. (New York State Department of Health, as of September 26, 2022)

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