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Association of substance use disorders and drug overdose with adverse COVID-19 outcomes in New York City: January–October 2020

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ABSTRACT

Background Evidence suggests that individuals with history of substance use disorder (SUD) are at increased risk of COVID-19, but little is known about relationships between SUDs, overdose and COVID-19 severity and mortality. This study investigated risks of severe COVID-19 among patients with SUDs.

Methods We conducted a retrospective review of data from a hospital system in New York City. Patient records from 1 January to 26 October 2020 were included. We assessed positive COVID-19 tests, hospitalizations, intensive care unit (ICU) admissions and death. Descriptive statistics and bivariable analyses compared the prevalence of COVID-19 by baseline characteristics. Logistic regression estimated unadjusted and sex-, age-, race- and comorbidity-adjusted odds ratios (AORs) for associations between SUD history, overdose history and outcomes.

Results Of patients tested for COVID-19 ($n = 188\,653$), 2.7% ($n = 5107$) had any history of SUD. Associations with hospitalization [AORs (95% confidence interval)] ranged from 1.78 (0.85–3.74) for cocaine use disorder (COUD) to 6.68 (4.33–10.33) for alcohol use disorder. Associations with ICU admission ranged from 0.57 (0.17–1.93) for COUD to 5.00 (3.02–8.30) for overdose. Associations with death ranged from 0.64 (0.14–2.84) for COUD to 3.03 (1.70–5.43) for overdose.

Discussion Patients with histories of SUD and drug overdose may be at elevated risk of adverse COVID-19 outcomes.

Keywords COVID-19, substance use disorder, drug overdose

Introduction

The SARS-CoV-2 (COVID-19) pandemic may disproportionately affect vulnerable populations, including people with substance use disorders (SUDs).[1,2] Evidence suggests that individuals with SUDs are at increased risk of COVID-19,[3] but little is known about relationships between SUDs, overdose and COVID-19 severity and mortality.[4] To address this gap, we conducted a retrospective study of patients tested for COVID-19 at a hospital system in New York City (NYC), an early COVID-19 hotspot and jurisdiction with high rates of opioid and other drug overdose (OD).[5]

Methods

We conducted a retrospective review of data from NYU Langone Health (NYULH), an academic medical center comprising four acute care hospitals across greater NYC.

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Table 1 Characteristics of patients tested for COVID-19 by PCR, 1 January to 26 October 2020

	COVID-tested patients *N* (%) 188 653 (100)	COVID-negative patients *N* (%) 176 823 (100)	COVID-positive patients *N* (%) 11 830 (100)	Chi-2 *P* value
Sex				
Female	107 597 (57.0)	101 462 (57.4)	6135 (51.9)	< 0001
Male	81 002 (42.9)	75 307 (42.6)	5695 (48.1)	
Unknown	54 (0.03)	54 (0.03)	0 (0)	
Age				
0–17 years	9950 (5.3)	9704 (5.5)	246 (2.1)	< 0001
18–44 years	73 182 (38.8)	68 961 (39.0)	4221 (35.7)	
45–64 years	59 959 (31.8)	56 012 (31.7)	3947 (33.4)	
65–74 years	22 807 (12.1)	21 329 (12.1)	1478 (12.5)	
75+ years	19 526 (10.4)	17 848 (10.1)	1678 (14.2)	
Unknown	3229 (1.7)	2969 (1.7)	260 (2.2)	
Race/ethnicity				
Non-Hispanic White	79 098 (41.9)	75 244 (42.6)	3854 (32.6)	< 0001
Non-Hispanic Black	20 226 (10.7)	18 494 (10.5)	1732 (14.6)	
Hispanic/Latino	53 535 (28.4)	49 721 (28.1)	3814 (32.2)	
Asian/Pacific Islander	11 676 (6.2)	10 834 (6.1)	842 (7.1)	
Other/multi-racial	11 328 (6.0)	10 544 (6.0)	784 (6.6)	
Unknown	12 790 (6.8)	11 986 (6.8)	804 (6.8)	
Medical history				
Asthma, COPD or emphysema	23 132 (12.3)	21 493 (12.2)	1639 (13.9)	0.013
Chronic kidney disease	10 313 (5.5)	8885 (5.0)	1428 (12.1)	< 0001
Diabetes	21 101 (11.2)	18 589 (10.5)	2512 (21.2)	< 0001
Heart failure	7734 (4.1)	6868 (3.9)	866 (7.3)	< 0001
SUD history				
Any SUD	5107 (2.7)	4712 (2.7)	395 (3.3)	< 0001
AUD	2582 (1.4)	2394 (1.4)	188 (1.6)	0.033
OUD	865 (0.5)	795 (0.5)	70 (0.6)	0.027
CAUD	1148 (0.6)	1074 (0.6)	74 (0.6)	0.806
COUD	541 (0.3)	501 (0.3)	40 (0.3)	0.281
History of OD	664 (0.4)	590 (0.3)	74 (0.6)	< 0001
Outcomes				
Hospitalized	6508 (3.5)	1215 (0.7)	5293 (44.7)	< 0001
Admitted to ICU	1337 (0.7)	192 (0.1)	1145 (9.7)	< 0001
Deceased	2381 (1.3)	1256 (0.7)	1125 (9.5)	< 0001

Note: Percentages may not sum to 100% due to rounding and missing data; SUD and medical histories are not mutually exclusive; chi-2 tests comparing characteristics among COVID-positive and COVID-negative patients.

SUD definitions: SUD history denotes an ICD-10 diagnosis for SUD recorded in at any time point in the NYULH HER; any SUD defined by any ICD-10 code F10-F19, excluding F17 (nicotine dependence); AUD defined as ICD-10 code F10; OUD defined as ICD-10 code F11; CAUD defined as ICD-10 code F12; COUD defined as ICD-10 code F14; history of OD defined as ICD-10 code T40, inclusive of all drug types.

Source: NYULH CDCD.

We used NYULH's COVID-19 Deidentified Clinical Database (CDCD), including patients tested for COVID-19 between 1 January and 26 October 2020 (N = 188,653). COVID-19 cases were defined as patients with positive results on reverse transcriptase polymerase chain reaction (PCR) assays of nasopharyngeal swab specimens. Before 16 March 2020, samples were analyzed by the NYC Public Health Laboratory or New York State Wadsworth Laboratory. Beginning

Table 2 Odds of adverse COVID-19 outcomes by SUD and overdose history

SUD history	COVID-19 positive		Hospitalization		ICU admission		Death	
	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)
Any SUD	1.26 (1.14–1.40)**	1.01 (0.91–1.13)	4.80 (3.76–6.12)**	4.35 (3.30–5.73)**	3.23 (2.54–4.09)**	2.50 (1.92–3.25)**	1.57 (1.17–2.10)*	1.23 (0.87–1.73)
AUD	1.18 (1.01–1.37)	0.93 (0.79–1.09)	6.67 (4.51–9.88)**	6.68 (4.33–10.33)**	3.20 (2.29–4.48)**	2.61 (1.80–3.79)**	1.20 (0.76–1.90)	0.91 (0.53–1.57)
OUD	1.32 (1.03–1.68)	1.01 (0.78–1.31)	5.46 (2.99–9.99)**	4.58 (2.35–8.95)**	3.02 (1.74–5.24)**	2.60 (1.42–4.79)*	1.59 (0.81–3.12)	1.38 (0.61–3.12)
CAUD	1.03 (0.81–1.30)	0.92 (0.72–1.17)	3.60 (2.14–6.08)**	5.14 (2.92–9.04)**	1.13 (0.54–2.36)	1.22 (0.56–2.64)	0.54 (0.20–1.49)	0.89 (0.29–2.72)
COUD	1.19 (0.86–1.65)	0.84 (0.60–1.18)	2.57 (1.33–4.99)*	1.78 (0.85–3.74)	1.04 (0.37–2.92)	0.57 (0.17–1.93)	0.77 (0.24–2.50)	0.64 (0.14–2.84)
History of OD	1.88 (1.48–2.40)**	1.49 (1.16–1.91)*	9.02 (4.49–18.12)**	5.40 (2.55–11.45)**	7.70 (4.85–12.23)**	5.00 (3.02–8.30)**	4.94 (3.04–8.03)**	3.03 (1.70–5.43)**

*$P < 0.0125$.

**$P < 0.001$.

Note: Models adjusted for age, sex, race and comorbidities; Bonferroni-corrected $P < 0.0125$ used to correct for four outcomes.

Note: Odds of COVID-19 positive test result among all patients tested for COVID-19 by PCR at NYULH; odds of hospitalization, ICU admission or death among all patients with a positive test result.

SUD definitions: SUD history denotes an ICD-10 diagnosis for SUD recorded in at any time point in the NYULH EHR; any SUD defined by any ICD-10 code F10-F19, excluding F17 (nicotine dependence); AUD defined as ICD-10 code F10; OUD defined as ICD-10 code F11; CAUD defined as ICD-10 code F12; COUD defined as ICD-10 code F14; history of OD defined as ICD-10 code T40, inclusive of all drug types.

Source: NYULH CDCD.

16 March 2020, the NYULH clinical laboratory analyzed samples. Use of the CDCD is exempt under NYULH's Institutional Review Board.

We assessed four outcomes: positive COVID-19 tests, hospitalizations, intensive care unit (ICU) admissions and death. We defined hospitalizations and ICU admissions as admissions for patients with positive tests whose COVID-19 diagnoses were dated concurrently or prior to admission. SUDs and overdose were assessed using ICD-10 codes F10 (alcohol use disorder; AUD), F11 (opioid use disorder; OUD), F12 (cannabis use disorder; CAUD), F14 (cocaine use disorder; COUD), T40 (OD) and F10–F16 and F18–F19 (any SUD). Diabetes, heart failure, chronic kidney disease and asthma, chronic obstructive pulmonary disease (COPD) and emphysema were assessed, guided by research on COVID-19 outcomes at NYULH.[6] Patient sex, age group, race and living status were obtained from the CDCD.

We calculated descriptive statistics and bivariable analyses to compare the prevalence of COVID-19 by baseline characteristics. We used logistic regression to estimate unadjusted and sex-, age-, race- and comorbidity-adjusted odds ratios (AORs) for associations between SUD indicators and outcomes. A Bonferroni-corrected $P < 0.0125$ was used for statistical significance (corrected for four outcomes). Analyses were conducted using R version 3.6.2.

Results

Of patients tested for COVID-19 ($n = 188\ 653$), 57.0% were female; 22.5% were 65 years or older; 41.9% were non-Hispanic white, 28.4% Hispanic/Latino and 10.7% non-Hispanic Black. Asthma/COPD/emphysema was the most prevalent comorbidity ($n = 23\ 132$, 12.3%), followed by diabetes ($n = 21\ 101$, 11.2%), chronic kidney disease ($n = 10\ 313$, 5.5%) and heart failure (7734, 4.1%). In total, 5107 patients had any SUD (2.7%), with AUD most prevalent ($n = 2{,}582$; 1.4%), followed by CAUD ($n = 1{,}148$, 0.6%), OUD ($n = 865$, 0.5%) and COUD ($n = 541$, 0.3%). Overdose was observed in 664 patients (0.4%). COVID-19 incidence was 6.3% positive (Table 1).

Overdose was associated with COVID-19 [AOR 1.49 (95% confidence interval; CI: 1.16–1.91). Each SUD indicator except COUD was associated with hospitalization; AORs ranged from 4.35 (3.30–5.73) for SUD to 6.68 (4.33–10.33) for AUD. SUD, AUD and OUD were associated with over 2.5 times the odds of ICU admission, and OD with five times the odds [5.00 (3.02–8.30)]. Overdose was associated with mortality [3.03 (1.70–5.43)] (Table 2).

Discussion

This study corroborates prior research and demonstrates that patients with SUDs face disproportionate risk of critical COVID-19 illness.[3] Although COVID-19 diagnoses were dated concurrently or prior to admission, we cannot assure whether outcomes were due to COVID-19 or unrelated. Additionally, we adjusted for few comorbidities; due to missing data, body mass index, an important predictor,[6] was not assessed. Despite these limitations, this study highlights the need for research identifying risk mechanisms of severe COVID-19 among patients with SUD, such as presentation timing or provider stigma.

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Conflicts of interest

The authors declare no conflicts of interest.

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