

Changes in alcohol-related hospital visits during COVID-19 in New York City

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ABSTRACT

Background and Aims Increased alcohol consumption has been proposed as a potential consequence of the coronavirus disease 2019 (COVID-19) pandemic. There has been little scrutiny of alcohol use behaviors resulting in hospital visits, which is essential to guide pandemic public policy. We aimed to determine whether COVID-19 peak restrictions were associated with increased hospital visits for alcohol use or withdrawal. Secondary objectives were to describe differences based on age, sex and race, and to examine alcohol-related complication incidence. **Design** Multi-center, retrospective, pre–post study. **Setting** New York City health system with five participating hospitals. **Participants** Adult emergency department encounters for alcohol use, alcoholic gastritis or pancreatitis or hepatitis, alcohol withdrawal syndrome, withdrawal seizure or delirium tremens. **Measurements** Age, sex, race, site and encounter diagnosis. Encounters were compared between 2019 and 2020 for 1 March to 31 May. **Findings** There were 2790 alcohol-related visits during the 2019 study period and 1793 in 2020, with a decrease in total hospital visits. Of 4583 alcohol-related visits, median age was 47 years, with 22.3% females. In 2020 there was an increase in percentage of visits for alcohol withdrawal [adjusted odds ratio (aOR) = 1.34, 95% confidence interval (CI) = 1.07–1.67] and withdrawal with complications (aOR = 1.40, 95% CI = 1.14–1.72), and a decline in percentage of hospital visits for alcohol use (aOR = 0.70, 95% CI = 0.59–0.85) and use with complications (aOR = 0.71, 95% CI = 0.58–0.88). It is unknown whether use visit changes mirror declines in other chief complaints. The age groups 18–29 and 60–69 years were associated with increased visits for use and decreased visits for withdrawal, as were non-white race groups. Sex was not associated with alcohol-related visit changes despite male predominance. **Conclusions** In New York City during the initial COVID-19 peak (1 March to 31 May 2020), hospital visits for alcohol withdrawal increased while those for alcohol use decreased.

Keywords Alcohol, alcohol use disorder, alcohol withdrawal, alcoholic gastritis, alcoholic hepatitis, alcoholic pancreatitis, COVID, delirium tremens, quarantine.

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INTRODUCTION

Increased alcohol consumption and its detrimental effects have been raised as a potential consequence of the coronavirus disease 2019 (COVID-19) pandemic [1–3]. Risk factors for increases during the pandemic include social isolation, psychological distress, loss of non-alcohol activities, financial stressors, inability to visit outpatient providers due to closure or fear and cancellation or virtualization of alcohol relapse prevention programs [3]. Prior studies suggest that mass traumatic events are associated with increased short-term alcohol consumption [4].

The first COVID-19 case occurred in New York City (NYC) on 1 March 2020. Schools and many businesses closed by 16 March, and on 20 March an executive order closed non-essential businesses state-wide [5]. While most industries were shuttered, the manufacture, distribution and sale of alcoholic beverages were deemed essential, and home alcohol delivery was permitted [6]. Some media reports describe increased alcohol sales during the pandemic. Although it is a logical extension that alcohol sales are a surrogate measure of consumption this is not established, and differences between consumer retail and commercial business sales obscure inferences from sales data [7,8]. Surveys world-wide have begun examining

changes in self-reported alcohol use behavior, but there has been little study of behaviors that result in hospital visits. Examining changes in alcohol use behaviors that warrant hospital visits is essential to guide public policy during pandemics.

This study evaluated changes in alcohol-related hospital visits during the COVID-19 surge in NYC, which has had more cases and deaths than any other US state or city [9]. The primary objective of this study was to determine whether the peak COVID-19 restrictions were associated with increased hospital visits for alcohol intoxication or withdrawal. Secondary objectives were to clarify differences among subgroups (based on age, sex and race) and to examine changes in the incidence of alcohol use and withdrawal complications relative to total alcohol-related visits.

METHODS

This was a multi-center, retrospective, pre–post study from five hospitals in a large, integrated private health system in NYC. The hospitals are located throughout NYC, and care for patients who are publicly insured, privately insured and uninsured. All hospitals linked to the health system's electronic medical record were included. Unique encounters were queried for 1 March 2019 to 31 May 2020. Inclusion criteria were emergency department visits during the above time-periods in adults ≥ 18 years, for the encounter diagnoses of alcohol use or intoxication, alcoholic gastritis or pancreatitis or hepatitis, alcohol withdrawal syndrome, alcohol withdrawal seizure or delirium tremens. Alcohol use was defined as encounter codes containing alcohol abuse, alcohol use, alcohol dependence or alcohol intoxication. When use or withdrawal was listed concurrently with an alcohol-related complication, only the complication was recorded (e.g. pancreatitis or withdrawal seizure). Patients were not considered to have acute alcoholic hepatitis if they had diagnoses of cirrhosis or ascites, as these are chronic conditions. Separate visits from the same patient were included as unique encounters. Race categories were based on the National Hospital Ambulatory Medical Care Survey, using white, black or African American and other [10]. Ethnicity was not included due to limitations in the data. This study was exempted by the hospital Institutional Review Board.

The proportion of alcohol-related hospital visits was calculated by dividing alcohol-related visits by total hospital visits per year. With a fixed sample of 2790 visits in 2019 and 1793 in 2020, there was 80% power to detect a 10% change in proportion of alcohol-related encounters and 90% power to detect a 20% change in proportion, assuming a baseline proportion of 5% of all visits, with 5% alpha. Descriptive statistics were performed on demographic variables (mean, standard deviation, frequency and

percentage) and two-sample Wilcoxon's rank-sum (Mann–Whitney) tests. For the secondary objective, ages were categorized into six groups. It is difficult to predict specific complications such as gastritis, pancreatitis or hepatitis, and these conditions often overlap, therefore complications were grouped for analysis. The analysis was not pre-registered thus results are considered exploratory.

Several logistic regression models were fitted in exploratory fashion, starting with a model of outcome using year, then progressively adding covariates of age, sex, hospital site (or a continuous variable of frequency of visits by site and year) and race. Model fit was compared with the Bayesian information criterion (BIC) and the optimal model was chosen based on the lowest BIC, which was the model of outcome adjusting for year, age group, sex, race and hospital. Odds ratios (ORs) and 95% confidence intervals (CIs) are reported with *P*-values < 0.05 . All analyses were conducted using Stata/SE version 16.1 (StataCorp, College Station, TX, USA).

RESULTS

From 1 March 1 to 31 May there were 2790 alcohol-related adult hospital visits in 2019, compared with 1793 during the same period in 2020. This 3-month period had a decrease in total hospital visits from 80 994 in 2019 to 55 067 in 2020. Encounter diagnoses are listed in Table 1. Of 4583 alcohol-related visits during the two study periods, there were 1021 females (22.3%). Median age was 46 years in 2019 and 47 in 2020; the most frequent age category was 50–59 years.

Compared to the control period in 2019, in 2020 there was an increase in proportion of visits for alcohol withdrawal [adjusted OR (aOR) = 1.36, 95% CI = 1.09–1.69] and withdrawal with complications (aOR = 1.42, 95% CI = 1.16–1.73) and a relative decline in proportion of visits for alcohol use (aOR = 0.7, 95% CI = 0.59–0.84) and use with complications (aOR = 0.71, 95% CI = 0.58–0.86).

Predictors of changes in alcohol-related visits are shown in Table 2. The age groups 18–29 and 60–69 years were positively associated with visits for alcohol use and use with complications and negatively associated for withdrawal and withdrawal with complications. Sex was not associated with visits in this sample, despite the male predominance. Race was associated with alcohol-related visits, with white patients less likely to present for alcohol use and more likely to present for withdrawal. There was significant variation in alcohol-related visits between the five hospitals studied.

There were 100 cases with unknown age (48 in 2019, 52 in 2020), which were excluded based on inclusion

Table 1 Alcohol-related adult hospital visit diagnoses in 2019 and 2020, during the 3-month period of 1 March–31 May.

Diagnosis	Cases March 1–May 31, 2019		Cases March 1–May 31, 2020	
Age, years (median, IQR)	46 (33–57)		47 (35–57)	
Age group (n, %)				
18–29	512	(18.4%)	217	(12.1%)
30–39	530	(19.0%)	371	(20.7%)
40–49	547	(19.6%)	420	(23.4%)
50–59	680	(24.4%)	438	(24.4%)
60–69	424	(15.2%)	285	(15.9%)
≥ 70	97	(3.5%)	62	(3.5%)
Race (n, %)				
White	880	(31.5%)	554	(30.9%)
Black or African American	736	(26.4%)	421	(23.5%)
Other	1032	(37.0%)	767	(42.8%)
Unknown/missing	142	(5.1%)	51	(2.8%)
Female	649	(23.3%)	372	(20.7%)
Total adult hospital visits	80 994		55 067	
Total adult alcohol-related visits	2790 (3.4%)		1793 (3.3%)	
Alcohol use	2485	(89.1%)	1499	(83.6%)
Alcoholic gastritis	45	(1.6%)	31	(1.7%)
Alcoholic pancreatitis	23	(0.8%)	38	(2.1%)
Alcoholic hepatitis	10	(0.4%)	7	(0.4%)
Alcohol withdrawal syndrome	195	(7.0%)	180	(10.0%)
Alcohol withdrawal seizure	15	(0.5%)	24	(1.3%)
Alcohol withdrawal delirium	17	(0.6%)	14	(0.8%)

IQR = interquartile range.

criteria. Cases with missing race were included, and no other data were missing.

DISCUSSION

During the COVID-19 initial surge period, data from a large health system in NYC demonstrated reduced rates of hospital visits for alcohol use and use with complications, and increased visits for alcohol withdrawal and withdrawal with complications. These findings account for an overall decline in hospital visits during COVID-19. The reduction in overall hospital visits is consistent with the pandemic experience of other hospitals in the northeastern United States [11].

The decrease in alcohol use visits may reflect a shift towards off-premise drinking in private homes and reduced intoxication in settings associated with ambulance calls, such as in bars or on streets with pedestrian traffic. This is speculative, and 56% of alcohol-related hospital visits nationally arrived by ambulance in 2011 [12]. The fall in alcohol use visits may alternately relate to people attempting to embrace healthier life-styles. Additionally, decreased alcohol use visits may be proportional to other non-COVID-19-related visits; one emergency department experienced relative decreases in syncope and stroke, for example, with relatively increased dyspnea [13].

Numerous on-line surveys have examined self-reported alcohol consumption during COVID-19, which complement the present study's focus on hospital presentations. Of Canadians staying home more due to COVID-19, 70% reported unchanged consumption while 18% increased consumption [14]. In European surveys, consumption was unchanged in 38–77%, decreased in 8–37% and increased in 10–35% [15–20]. Two surveys using the same screening test found harmful consumption decreased in Australia, while in China, although alcohol dependence was unchanged, hazardous/harmful drinking increased, primarily among males [21,22]. A separate Chinese survey found that alcohol use increased marginally from 31 to 33%, but more substantially in those with alcohol use disorders or regular consumption [23]. A health system in the United States found decreased overall emergency department visits, but alcohol-related visits increased proportionally from 1.7 to 2.6%, with proportional increases both for walk-ins and those brought by ambulance. This non-survey study did not convey significance testing, and lacked detail on use versus withdrawal [24].

Regarding withdrawal during COVID-19, a study in India examined the incidence of severe alcohol withdrawal presenting to psychiatry emergency services, defined as seizure, hallucinosis or delirium tremens [25]. Alcohol sales were banned from March to April 2020, during which 96 patients presented with severe withdrawal, compared

Table 2 Predictors of alcohol-related hospital visits between 2019 and 2020, during the 3-month period of 1 March–31 May using logistic regression. Adjusted odds ratios are listed with 95% confidence intervals.

	Alcohol use (n = 3984)	Alcohol use and complications (n = 4138)	Alcohol withdrawal (n = 375)	Alcohol withdrawal and complications (n = 445)
Peak COVID-19 period	0.70*** (0.59–0.85)	0.71*** (0.58–0.88)	1.34*** (1.07–1.67)	1.40*** (1.14–1.72)
Female	1.05 (0.85–1.31)	1.15 (0.89–1.48)	0.86 (0.66–1.14)	0.87 (0.67–1.12)
Age group (years)				
18–29	1.88** (1.13–3.11)	2.73*** (1.56–4.80)	0.41*** (0.23–0.75)	0.37*** (0.21–0.64)
30–39	0.97 (0.61–1.55)	1.17 (0.71–1.92)	0.87 (0.51–1.49)	0.85 (0.52–1.340)
40–49	1.28 (0.80–2.05)	1.59* (0.96–2.63)	0.64 (0.37–1.10)	0.63* (0.38–1.04)
50–59	1.39 (0.87–2.23)	1.48 (0.90–2.44)	0.68 (0.40–1.17)	0.67 (0.41–1.11)
60–69	2.06*** (1.25–3.41)	2.27*** (1.32–3.89)	0.52** (0.29–0.92)	0.44*** (0.26–0.76)
≥ 70	Reference group	Reference group	Reference group	Reference group
Race				
White	Reference group	Reference group	Reference group	Reference group
Black or African American	1.75*** (1.37–2.23)	2.54*** (1.90–3.40)	0.38*** (0.28–0.52)	0.39*** (0.29–0.53)
Other	1.48*** (1.21–1.82)	1.72*** (1.37–2.16)	0.56*** (0.44–0.71)	0.58*** (0.46–0.73)
Unknown/missing	2.88*** (1.63–5.10)	2.63*** (1.42–4.86)	0.36*** (0.19–0.71)	0.38*** (0.21–0.70)
Site				
1	Reference group	Reference group	Reference group	Reference group
2	1.13 (0.78–1.64)	0.86 (0.54–1.35)	1.00 (0.63–1.61)	1.17 (0.74–1.84)
3	1.73*** (1.21–2.48)	1.25 (0.81–1.94)	0.64* (0.41–1.02)	0.80 (0.52–1.24)
4	2.57*** (1.77–3.73)	1.76*** (1.13–2.80)	0.54** (0.34–0.86)	0.56** (0.36–0.89)
5	3.20*** (2.23–4.58)	2.02*** (1.30–3.16)	0.45*** (0.29–0.71)	0.50*** (0.32–0.77)

*** $P < 0.01$, ** $P < 0.05$, * $P < 0.1$.

to 79 cases in the prior 3 weeks when alcohol was available. In contrast to India, alcohol remained available in NYC and most areas world-wide where it was available pre-pandemic, so results may not be generalizable. The only other study to examine withdrawal visits found no significant change during COVID-19; however, alcohol use visits were not separately examined [13]. One argument for maintaining alcohol availability during the pandemic has been mitigation of potential withdrawal by abrupt cessation [26]. In the present study, incidence of alcohol withdrawal increased despite ongoing availability of alcohol in NYC, and it is unknown whether restricting alcohol availability would have further exacerbated the increased withdrawal. Reasons for increased withdrawal may relate to attempts to embrace healthier life-styles, fear of visiting stores or transportation issues. Limited prior literature examined effects of on- versus off-premise alcohol availability on consumption; however, applicability to pandemic scenarios is unclear [27].

This study examined age, sex and race as predictors. The reasons are unclear regarding age groups 18–29 and 60–69 years being positively associated with visits for use and negatively associated with visits for withdrawal. Callinan *et al.* found decreased harmful drinking in 18–25-year-olds, while other surveys have linked increased consumption to ages 18–34 and 30–59 years [22,28–30]. Age variation may also relate to overall relative changes in visits during the pandemic [13]. Sex

was not associated with alcohol-related visits despite male predominance in this sample, consistent with self-reported alcohol behaviors described by Neill *et al.* but in contrast to other studies, and would benefit from additional study [20,22,29]. In the United States, a small national survey found women had increased past-month consumption and alcohol-related consequences, while a separate survey found increased consumption among gay men using a narrowed sample [29,31]. White patients were less likely to present for alcohol use and more likely to present for withdrawal, and overall pandemic visit changes may be contributory. Past literature on race/ethnicity alcohol-visit disparities tend not to contrast use versus withdrawal, and this warrants additional study. Findings on race in this study may not be generalizable to all regions; while 77% of patients nationally with an alcohol-related hospital visit in 2011 were white, in this sample white patients comprised 31% of visits [12].

One study limitation is the lack of prospective case definitions for conditions in Table 1; rather, these were operationally defined based on clinician assessment, and thus relevant encounters could have been omitted. For example, pancreatitis due to alcohol use would be omitted if the clinician listed the more general term of ‘pancreatitis’ rather than ‘alcoholic pancreatitis’. The sampled time-period may not be representative of later periods in the pandemic. Additionally, although hospitals in the studied health system

are spread throughout NYC, the sample may not be representative of all NYC residents, and may not be generalizable to other areas nationally or globally. While this study collected race, the data lacked ethnicity as a reliable variable and it was therefore omitted; data on Hispanic/Latino ethnicity could have been significant in the model. Lastly, this study did not benchmark alcohol-related visit changes to other diagnoses, so although withdrawal visits proportionally increased and use visits proportionally decreased, it is unclear if the decline in use visits was proportionally similar to other non-COVID-19 visit reasons.

This study suggests that, in NYC during the initial COVID-19 peak, hospital visits for alcohol withdrawal proportionally increased while those for alcohol use decreased. Public policy during pandemics should be informed by changes in hospital visits related to substance use behaviors. Additional research should evaluate the scale of pandemic alcohol-related visit changes, benchmark them to other visit diagnoses, explore behavior change reasons and clarify subpopulations with risk factors that can be targeted for intervention.

Declaration of interests

None.

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Author contributions

Jonathan Schimmel: Conceptualization. **Carmen Vargas-Torres:** Formal analysis; methodology. **Nicholas Genes:** Data curation. **Marc Probst:** Writing-review; editing-Equal. **Alex Manini:** Methodology; supervision.

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