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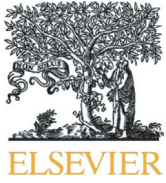


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Influence of Pennsylvania liquor store closures during the COVID-19 pandemic on alcohol withdrawal consultations

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ABSTRACT

Introduction: Alcohol withdrawal syndrome (AWS) is a serious consequence of alcohol use disorder (AUD). Due to the current COVID-19 pandemic there was a closure of Pennsylvania (PA) liquor stores on March 17, 2020.

Methods: This is a retrospective, observational study of AWS patients presenting to a tertiary care hospital. We used descriptive statistics for continuous and categorical variables and compared AWS consults placed to the medical toxicology service for six months preceding liquor store closure to those placed between March 17, 2020 and August 31, 2020. We compared this to consults placed to the medical toxicology service placed from October 1, 2019 through March 16, 2020. Charts were identified based on consults placed to the medical toxicology service, and alcohol withdrawal was determined via chart review by a medical toxicologist. This study did not require IRB approval. We evaluated Emergency Department (ED) length of stay (LOS), weekly and monthly consultation rate, rate of admission and ED recidivism, both pre- and post-liquor store closure.

Results: A total of 324 AWS consults were placed during the ten month period. 142 (43.8%) and 182 (56.2%) consults were pre- and post-liquor store closure. The number of consults was not statistically significant comparing these two time frames. There was no significant difference by patient age, gender, or race or by weekly or monthly consultation rate when comparing pre- and post-liquor store periods. The median ED LOS was 7 h (95% Confidence Interval (CI) Larson et al. (2012), Pollard et al. (2020) [5, 11]) and did not significantly differ between pre- and post-liquor store periods ($p = 0.78$). 92.9% of AWS patients required admission without significant difference between the pre- and post-liquor store closure periods (94.4% vs. 91.8%, $p = 0.36$). There was a significant increase in the number of AWS patients requiring a return ED visit (Odds Ratio 2.49; 95% CI [1.38, 4.49]) post closure.

Conclusion: There were nearly 2.5 times greater odds of ED recidivism among post-liquor store closure AWS patients compared with pre-closure AWS patients.

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1. Introduction

The COVID-19 pandemic has placed significant strain on the United States (US) health care system and has hampered the ability to care for those suffering from alcohol use disorder (AUD) [1]. Alcohol withdrawal syndrome (AWS) is a complex and potentially life-threatening medical condition that warrants early involvement of a medical toxicologist, where available, to help guide management [2]. Alcohol withdrawal syndrome was already one of the most common reasons to consult the medical toxicology service at Lehigh Valley Health Network.

However, with the forced PA liquor store closure beginning March 17, 2020 due to COVID-19, a rise in AWS patients was predicted.

Alcohol withdrawal syndrome occurs after cessation of ethanol consumption and commonly includes clinical manifestations such as tremulousness, hallucinations, seizures and delirium tremens. Common pharmacologic treatments for AWS include intravenous fluids, dextrose, thiamine and titrated benzodiazepines or barbiturates. Additionally, linking a patient to a comprehensive rehabilitation treatment program is critical to maintain long-term success [3].

2. Methods

This was a retrospective, observational study of patients presenting to a tertiary care hospital with AWS. We used descriptive statistics to analyze continuous and categorical variables. We assessed continuous

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Table 1
Characteristics of patients by closure status of liquor stores.

	Pre-Closure n(%)	Post-Closure n(%)	P Value
Age			0.24
21–40	48(33.8)	46(25.3)	
41–60	67(47.2)	99(54.4)	
61 and Older	27(19.0)	37(20.3)	
Female	30(21.1)	50(27.5)	0.19
Non-Caucasian	12(8.45)	18(9.9)	0.70
Discharged	8(5.6)	15(8.2)	0.36
ED Return	19(13.4)	49(26.9)	0.002

variables for normality, graphically and by the Ryan-Joiner normality test. We presented continuous variables as either means (\pm standard deviation) or the median (25% Quartile, 75% Quartile), and categorical variables as frequencies and percentages. We compared continuous variables using the two-sample *t*-test or the Mood's median test and categorical variables using the Chi squared or the Fisher's Exact test. We used logistic regression to calculate the odds of a return to the ED

after adjusting for potential confounders of age, gender, and race. We based statistical significance on a two-sided test using a significance level of 0.05 (*p* value <0.05) and conducted this analysis using Minitab 17 (Minitab Inc.).

3. Results

There was a total of 324 consults—of which 142 (43.8%) were pre-liquor, and 182 (56.3 = 2%) post-liquor store closure. Over half of the patients (*n* = 166, 51.2%) were 41–60 years old, while the remaining were either 21 to 40 (*n* = 94, 29%) or over 61 years old (*n* = 64, 19.8%). The patients were predominantly male (*n* = 244, (75.3%)) and Caucasian (*n* = 294, (90.7%)). As shown in Table 1, there was no significant difference in patient age, gender, or race when comparing pre- and post-liquor store periods.

The median emergency department ED length of stay LOS was 7 h (5,10). The median ED LOS did not significantly differ between the pre- and post-liquor store periods (7.0 vs 7.0 h; *p* = 0.78). The average (\pm standard deviation) monthly rate of consultation pre- and post- liquor store closure was 25.5 \pm 10.2 and 34.2 \pm 16.9,

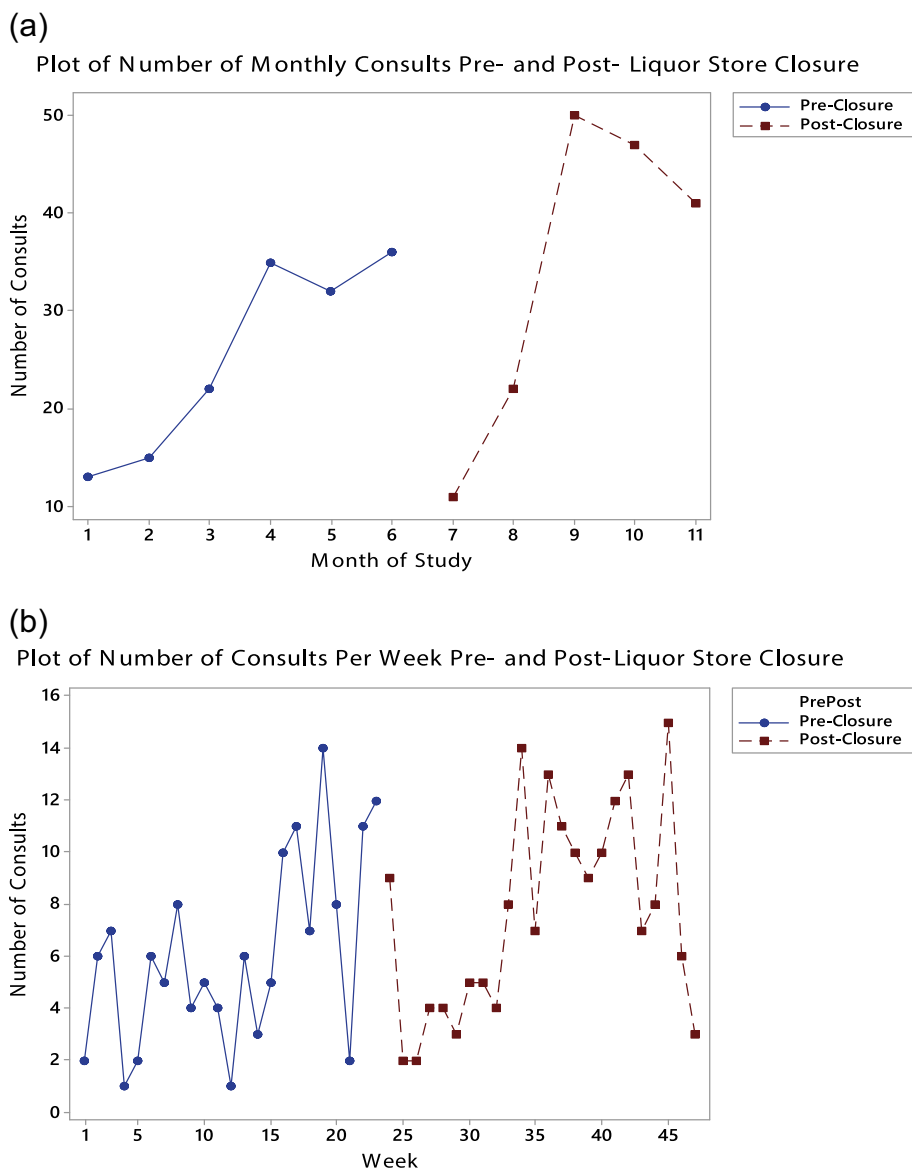


Fig. 1. Monthly frequency of Alcohol Withdrawal Syndrome consults pre- and post-closure of PA liquor stores. Fig. 1b. Weekly frequency of Alcohol Withdrawal Syndrome consults.

respectively. Fig. 1a and 1b display the weekly and monthly frequency of consultations pre- and post- liquor store closure, respectively. The mean (\pm standard deviation) weekly rate of consultation pre- and post- liquor store closure was 6.1 ± 3.7 and 7.7 ± 4.0 , respectively. The difference in the mean monthly ($p = 0.35$) and weekly ($p = 0.16$) rate of consult between pre- and post-liquor closure was not statistically significant.

The majority of the patients required an admission ($n = 91$, 92.9%) with no significant difference between pre- and post-liquor store closure time periods (94.4% vs 91.8%, $p = 0.36$). Table 2 displays the odds of a return to the ED among patients in the post-liquor store closure relative to pre-closure after adjusting for age, race, and gender. As shown, there was nearly two and a half fold greater odds of return to the ED among the post-closure patients as compared with the pre-closure period patients (Odds Ratio [OR], 2.49; 95% Confidence Interval [CI], 1.38, 4.49).

4. Discussion

Our study demonstrated an increase in ED recidivism following liquor store closures during the COVID-19 pandemic. The etiology of this increase is likely multifactorial and potentially reflects the high-risk nature of the disease of AUD. Alcohol use is the third leading cause of preventable death and is responsible for approximately 95,000 deaths annually [4]. It is estimated that AUD affects nearly one-third of US adults at some point in their lives.

Patients with AWS experience a high rate of recidivism and multiple hospital admissions due to several risk factors, including medical comorbidities, psychiatric comorbidities, other substance use disorders, and lower level of education [5]. Moreover, feelings of social isolation increase stress and decrease cognitive control, which are also major AUD risk factors. In contrast, social support is a protective factor for AUD [6]. Not only is stress a trigger for increased alcohol use, but persistent alcohol use and recurrence of use promote a persistent dysregulation of brain reward and stress systems [7]. Social distancing, isolation and quarantine are essential measures to prevent the spread of COVID-19; however, these conditions may worsen substance use disorder (SUD) or lead to recurrent substance use [1]. As a result of the COVID-19 pandemic, increases in AUD were estimated at 19% according to one source. Similarly, 32% of persons who drink alcohol regularly reported increased use during the pandemic [9].

As shown in Fig. 1, there was a sharp rise in the number of AWS consultations. This correlates with the first two months of the pandemic and likely reflects increased social isolation and financial stress. In addition to rising SUD, there was a decrease in overall ED volume in the hospital network. Comparing the network ED volumes between October 2019 to March 16, 2020 and March 17, 2020 to August 31, 2020, there was an approximate 32% decline in the ED volume. This highlights that although there was a decrease in the overall ED volume, patients with SUD were still seeking treatment and the high rate of recidivism.

The increase in ED recidivism for AUD following closures of liquor stores is consistent with other studies which have demonstrated pandemic-related increase in consumption of alcohol, coupled with poor underlying mental health in vulnerable individuals [10]. One study found the frequency of alcohol use increased overall, especially in and

adult women aged 30 to 59, indicating that increased use of alcohol itself is another consequence of the US COVID-19 pandemic [11]. Aside from the deleterious physical consequences of increased alcohol use, excessive alcohol consumption can lead to, or worsen, mental health problems such as depression and anxiety. [11] Additional COVID-19 related factors reported in the literature include a reduced access to supply of alcohol placing dependent individuals at risk for severe withdrawal, as well as increased barriers to accessing treatment for substance use [12]. While our study did not explore the underlying factors contributing to increased recidivism, future studies may highlight potential causes of increased risk within this vulnerable population during a national crisis. To reduce risk among vulnerable patients with SUD or AUD, development of mechanisms to both improve harm reduction and also promote linkage to treatment that can withstand crises is warranted.

One limitation of our study is that the patient population included only those treated by a medical toxicologist. There were likely other patients treated in the hospital for AUD or AWS not examined by the medical toxicology service.

5. Conclusion

In the context of the US COVID-19 pandemic and ensuing PA liquor store closure, there was both a 12.5% increase in AWS consults to the medical toxicology service and nearly 2.5 times greater odds of ED recidivism among post-liquor store closure AWS patients compared with pre-closure AWS patients.

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Informed consent

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed consent was obtained from all patients for being included in the study.

The authors declare that there is no conflict of interest regarding the publication of this article. The authors have no outside support information, conflicts or financial interest to disclose and this work has not been published elsewhere.

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This study was approved for human research by Lehigh Valley Hospital and Health Network's IRB (STUDY00000652).

Author contributions

All authors provided substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data. All authors gave final approval of the version of the article to be published.

Declaration of Competing Interest

None.

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Table 2
Odds of Return to the Emergency Department.

	OR	(95% CI)
Pre- vs Post-Closure	2.49	(1.38,4.49)
Female vs Male	0.93	(0.49,1.76)
Age	Reference	
21–40	0.73	(0.39,1.36)
41–60	0.73	(0.48,1.63)
61 and Older	0.73	(0.48,1.63)

Abbreviations: OR represents Odds Ratio; CI, Confidence Interval.

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