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TBM

COVID-19 exposure and diagnosis among college student drinkers: links to alcohol use behavior, motives, and context

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Abstract

The COVID-19 pandemic is a public health crisis. College student alcohol use is highly prevalent and primarily occurs in social settings where risk for COVID-19 transmission is heightened. This study explored the associations between alcohol use frequency, quantity, motives, and context with: (i) quarantine due to COVID-19 exposure and (ii) a positive diagnosis for COVID-19. A sample of $n = 409$ college student drinkers completed an online survey about their health and behaviors during the Fall 2020 semester. Since the start of the semester, 36% of students quarantined and 13% of students received a COVID-19 diagnosis. More frequent alcohol use was associated with increased odds of both quarantine and COVID-19 diagnosis. More frequent drinking for social motives was associated with increased likelihood of quarantine, and more frequent drinking for conformity motives was associated with increased likelihood of COVID-19 diagnosis. Participants who often drank alone or with a small group of friends were about half as likely to have quarantined, while those who often drank with a large group of friends were almost twice as likely to have quarantined. Participants who often drank in a bar or nightclub had almost three times the odds of a COVID-19 diagnosis. Frequent alcohol use and drinking for social and conformity motives and in certain contexts are linked to increased likelihood of COVID-19 exposure and diagnosis. Alcohol use prevention efforts, coupled with messaging to discourage large social gatherings in public places, might help to mitigate the spread of COVID-19 among college students.

Keywords

College students, Alcohol use, Motives, Context, COVID-19

INTRODUCTION

As of March 2021, there have been over 28,000,000 cases and 520,000 deaths from the coronavirus disease 2019 (COVID-19) in the USA [1]. The pandemic has had a significant impact on higher education, with almost all U.S. colleges and universities closing their campuses and ending in-person instruction in Spring 2020. Many institutions implemented public health and safety protocols when reopening in Fall 2020; however, an ongoing survey has identified over 530,000 cases and at least 100 deaths from COVID-19 on college campuses since the pandemic began [2].

Preventing the spread of COVID-19 among college students is a public health priority, as weekly cases increased 55% nationally among young adults ages 18–22 from August 2 to September 5, 2020 [3]. Young adults are likely to contribute to community spread to those at higher risk for severe illness [4], and the reopening of universities in Fall 2020 was associated with increases in COVID-19 cases in the surrounding counties [5]. College campuses are densely populated with frequent movement between academic, residential, and social settings [6], and engagement in preventive behaviors (e.g., mask wearing, avoidance of public places, and cancellation of social activities) is least prevalent among adults ages 18–29 as compared to other adult age groups [7].

While research is emerging, there is currently limited information on risk factors for COVID-19 among college students. One risk factor in need of study is alcohol use, which is highly prevalent and often heavy during college [8]. The potential link between alcohol use and COVID-19 among college students might be physiological, as the effects of heavy drinking increase risk for viral lung infections such as COVID-19 [9]. Alternatively, this link might be explained by the contextual factors of alcohol use among college students. COVID-19 is commonly spread through respiratory droplets released and inhaled when people are in close contact [10]. College students frequently endorse social motives

Implications

Practice: College student drinkers are a potentially high-risk group for being exposed to and contracting COVID-19, highlighting the need for targeted prevention efforts.

Policy: Higher education institutions should include messaging about alcohol use prevention and limitation of in-person social interaction in their campus COVID-19 mitigation plans.

Research: Future research should continue to explore the relationship between college student substance use and COVID-19, utilizing multi-campus and longitudinal study designs.

for drinking [11], and college student alcohol use often occurs in contexts where risk for COVID-19 exposure would be high, such as drinking with friends, at parties, and in dorms, Greek houses, and bars [12].

While prior studies of college students have examined changes in alcohol use during the pandemic [13, 14] and links between anxiety about COVID-19 and drinking desire [15], research is needed on the association between college student alcohol use and COVID-19 risk. Accordingly, this study utilized a sample of college student drinkers to examine associations between alcohol use frequency, quantity, motives, and context with: (i) quarantine due to COVID-19 exposure and (ii) a positive diagnosis for COVID-19 during the Fall 2020 semester.

METHODS

This study was conducted at a large, public university in the southeast region of the USA during the Fall 2020 semester. The university had a shortened semester and offered in-person, hybrid, and online instruction. Residence halls and campus buildings were open to students, faculty, and staff with public health protocols in place. Eligible participants for the study were undergraduate students 18 years or older who were enrolled at the main university campus.

During the final weeks of the semester, a link to a 60-question online survey was sent to a panel of 5,000 undergraduate students and was also made available through a campus-wide email newsletter. The survey was open for 2.5 weeks, and a total of $n = 664$ students responded to the survey. $N = 34$ students were excluded for not meeting eligibility criteria, and $n = 48$ students were excluded for not responding to survey questions related to their COVID-19 experiences. The analytic sample for the current study ($n = 409$) excluded students who had been diagnosed with COVID-19 prior to the beginning of the fall semester ($n = 38$) and those who had not consumed alcohol during the fall semester ($n = 135$). The analytic sample had a mean age of 20.5 years and was 71% female and 83% non-Hispanic white. The sample was 18% freshmen, 21% sophomores, 25% juniors, and 37% seniors.

Participants provided informed consent, and approval was obtained by the university's Institutional Review Board. As a thank you for participation, students could choose to enter themselves into a raffle to receive one of twenty $25 gift cards.

Measures

Standard questions were used to collect data on age, gender, and race/ethnicity. Participants indicated if they had been diagnosed or treated for a physical health condition (e.g., diabetes, asthma) in the past year.

Alcohol use questions referred to drinking behavior since the semester had begun. Alcohol use frequency was measured by the number of days in a typical week when students consumed alcohol, and alcohol use quantity was measured by the number of drinks students had on a typical drinking day. Alcohol use motives were assessed using the Drinking Motive Questionnaire Revised Short Form (DMQ-R SF) [16], with four subscales measuring enhancement, social, conformity, and coping motives. Response options for each motive included never (0), sometimes (1), and almost always (2), and mean scores for each subscale were computed. Based on prior drinking context research [12, 17], participants indicated their frequency of drinking in nine physical and social contexts. Each context item was recoded into a dichotomous variable representing drinking in that context never/seldom (0) or occasionally/frequently (1).

Using questions adapted with permission from the Healthy Minds Study [18], participants indicated whether they had quarantined due to exposure to COVID-19 and/or received a positive COVID-19 diagnosis since the beginning of the semester. Quarantine was defined for participants as a method to keep someone who might have been exposed to COVID-19 away from others, and this variable acts as a proxy for COVID-19 exposure within the context of this study. Participants indicated whether they had COVID-19 since the semester started: (i) yes, confirmed by a test; (ii) probably (e.g., a healthcare provider told me that I likely had COVID-19, but it was not confirmed by a test); (iii) maybe (e.g., I have had symptoms consistent with COVID-19, but it was not confirmed by a test); and (iv) no (no symptoms or other reason to think I have had it). Only participants who had a positive diagnosis confirmed by a test were coded as having had COVID-19. COVID-19 prevention behaviors were assessed using three questions on the frequency of following recommendations related to hygiene (very closely, somewhat closely, not closely, not at all), social/physical distancing (very closely, somewhat closely, not closely, not at all), and mask wearing in public (all the time, most of the time, sometimes, rarely, never).

Statistical analysis

The first set of multivariate logistic regression models tested the associations between alcohol use frequency, quantity, and motive mean scores with two dichotomous outcomes since the semester started: (i) having to quarantine and (ii) receiving a positive diagnosis for COVID-19. All predictor variables were entered into the models simultaneously. The second set of logistic regression models tested the associations between each alcohol use context variable with quarantine experience and COVID-19 diagnosis. All nine context variables were entered into the models simultaneously. Prior to regression analyses, phi coefficients were computed to explore the strength of the associations between all

context variables. The majority of the context variables had weak or moderate associations with each other ($\varphi < 0.5$). The strongest associations were between drinking at someone else's residence and with a small group of friends ($\varphi = 0.556$), drinking at a restaurant and at a bar/nightclub ($\varphi = 0.651$), and drinking at a party and with a large group of friends ($\varphi = 0.613$).

Models controlled for age, gender, race/ethnicity, past-year physical health condition, and adherence to hygiene, social/physical distancing, and face mask recommendations. Alcohol use context models also controlled for alcohol use frequency and quantity. SPSS Version 26.0 was used for analyses with a 0.05 alpha level.

RESULTS

Since the start of the semester, 146 (36%) students quarantined and 53 (13%) students were diagnosed with COVID-19. Descriptive statistics for alcohol use behavior, motives, and context can be found in Table 1.

Table 1 | Alcohol use behavior, motives, and context, by quarantine experience and COVID-19 diagnosis

	Total sample (n = 409)	Quarantine		COVID-19 diagnosis	
		Yes (n = 146)	No (n = 263)	Yes (n = 53)	No (n = 356)
Alcohol use behavior	Mean ± SD				
Typical weekly alcohol use frequency [0–7 days]	1.72 ± 1.29	1.88 ± 1.20	1.64 ± 1.34	2.34 ± 1.43	1.63 ± 1.25
Typical alcohol use quantity [1–12 drinks]	3.22 ± 1.90	3.38 ± 1.82	3.12 ± 1.94	3.81 ± 1.83	3.13 ± 1.89
Alcohol use motives mean score					
Enhancement motives [0–2]	0.88 ± 0.46	0.89 ± 0.43	0.87 ± 0.48	1.01 ± 0.39	0.86 ± 0.47
Social motives [0–2]	1.03 ± 0.62	1.13 ± 0.64	0.97 ± 0.60	1.30 ± 0.60	0.99 ± 0.61
Conformity motives [0–2]	0.28 ± 0.46	0.32 ± 0.46	0.26 ± 0.46	0.48 ± 0.60	0.25 ± 0.42
Coping motives [0–2]	0.57 ± 0.57	0.55 ± 0.57	0.58 ± 0.56	0.69 ± 0.61	0.55 ± 0.56
Alcohol use context	n (Column %)				
At your residence					
Never/seldom	185 (45.5)	65 (44.5)	120 (46.0)	22 (41.5)	163 (46.0)
Occasionally/frequently	222 (54.5)	81 (55.5)	141 (54.0)	31 (58.5)	191 (54.0)
At someone else's residence					
Never/seldom	182 (44.7)	51 (34.9)	131 (50.2)	16 (30.2)	166 (46.9)
Occasionally/frequently	225 (55.3)	95 (65.1)	130 (49.8)	37 (69.8)	188 (53.1)
At a restaurant					
Never/seldom	268 (66.0)	86 (59.3)	182 (69.7)	24 (45.3)	244 (69.1)
Occasionally/frequently	138 (34.0)	59 (40.7)	79 (30.3)	29 (54.7)	109 (30.9)
At a bar or nightclub					
Never/seldom	274 (67.3)	83 (56.8)	191 (73.2)	19 (35.8)	255 (72.0)
Occasionally/frequently	133 (32.7)	63 (43.2)	70 (26.8)	34 (64.2)	99 (28.0)
At a party					
Never/seldom	199 (48.9)	56 (38.4)	143 (54.8)	12 (22.6)	187 (52.8)
Occasionally/frequently	208 (51.1)	90 (61.6)	118 (45.2)	41 (77.4)	167 (47.2)
Alone					
Never/seldom	352 (86.7)	134 (91.8)	218 (83.8)	49 (92.5)	303 (85.8)
Occasionally/frequently	54 (13.3)	12 (8.2)	42 (16.2)	4 (7.5)	50 (14.2)
With a small group of friends					
Never/seldom	120 (29.5)	42 (28.8)	78 (29.9)	12 (22.6)	108 (30.5)
Occasionally/frequently	287 (70.5)	104 (71.2)	183 (70.1)	41 (77.4)	246 (69.5)
With a large group of friends					
Never/seldom	260 (63.9)	74 (50.7)	186 (71.3)	20 (37.7)	240 (67.8)
Occasionally/frequently	147 (36.1)	72 (49.3)	75 (28.7)	33 (62.3)	114 (32.2)
With family members					
Never/seldom	293 (72.0)	96 (65.8)	197 (75.5)	34 (64.2)	259 (73.2)
Occasionally/frequently	114 (28.0)	50 (34.2)	64 (24.5)	19 (35.8)	95 (26.8)

Note. A small group of friends was defined as 10 people or less and a large group of friends was defined as more than 10 people.
SD, standard deviation.

Table 2 | Associations between alcohol use behavior and motives with quarantine experience and COVID-19 diagnosis among college student drinkers ($n = 409$)

	Quarantine		COVID-19 diagnosis	
	AOR (95% CI)	p-value	AOR (95% CI)	p-value
Alcohol use behavior				
Typical weekly alcohol use frequency	1.24 (1.01, 1.52)*	0.044	1.46 (1.11, 1.91)**	0.007
Typical alcohol use quantity	1.08 (0.94, 1.24)	0.287	1.18 (0.97, 1.43)	0.091
Alcohol use motives mean score				
Enhancement motives	0.52 (0.26, 1.02)	0.056	0.67 (0.24, 1.86)	0.440
Social motives	1.80 (1.09, 2.98)*	0.022	1.91 (0.91, 3.99)	0.086
Conformity motives	1.36 (0.80, 2.33)	0.256	2.38 (1.19, 4.78)*	0.015
Coping motives	0.63 (0.39, 1.00)	0.051	0.75 (0.39, 1.44)	0.384

Note. Estimates are adjusted for all other alcohol use predictors as well as age, gender, race/ethnicity, past-year physical health condition, and adherence to hygiene, social/physical distancing, and face mask recommendations.
AOR, adjusted odds ratio; *CI*, confidence interval.
*$p < 0.05$, **$p < 0.01$.

Table 3 | Associations between alcohol use context, quarantine experience, and COVID-19 diagnosis among college student drinkers ($n = 409$)

	Quarantine		COVID-19 diagnosis	
	AOR (95% CI)	p-value	AOR (95% CI)	p-value
At your residence				
Never/seldom	Reference		Reference	
Occasionally/frequently	1.06 (0.61, 1.85)	0.844	0.71 (0.30, 1.69)	0.442
At someone else's residence				
Never/seldom	Reference		Reference	
Occasionally/frequently	1.42 (0.77, 2.64)	0.262	0.67 (0.25, 1.78)	0.422
At a restaurant				
Never/seldom	Reference		Reference	
Occasionally/frequently	0.73 (0.38, 1.43)	0.361	1.00 (0.38, 2.65)	0.999
At a bar or nightclub				
Never/seldom	Reference		Reference	
Occasionally/frequently	1.62 (0.81, 3.23)	0.174	2.88 (1.08, 7.67)*	0.034
At a party				
Never/seldom	Reference		Reference	
Occasionally/frequently	1.22 (0.64, 2.33)	0.538	2.36 (0.84, 6.65)	0.104
Alone				
Never/seldom	Reference		Reference	
Occasionally/frequently	0.41 (0.18, 0.93)*	0.032	0.39 (0.10, 1.55)	0.183
With a small group of friends				
Never/seldom	Reference		Reference	
Occasionally/frequently	0.45 (0.22, 0.92)*	0.029	0.56 (0.19, 1.71)	0.310
With a large group of friends				
Never/seldom	Reference		Reference	
Occasionally/frequently	1.90 (1.01, 3.57)*	0.047	1.46 (0.59, 3.58)	0.410
With family members				
Never/seldom	Reference		Reference	
Occasionally/frequently	1.41 (0.83, 2.40)	0.200	0.91 (0.43, 1.93)	0.801

Note. Estimates are adjusted for all other alcohol use contexts as well as typical weekly alcohol use frequency, typical alcohol use quantity, age, gender, race/ethnicity, past-year physical health condition, and adherence to hygiene, social/physical distancing, and face mask recommendations.
AOR, adjusted odds ratio; *CI*, confidence interval.
*$p < 0.05$.

Alcohol use frequency, but not quantity, was associated with likelihood of both quarantine and COVID-19 diagnosis (see Table 2). Each additional drinking day in a typical week was associated with a 24% increase in odds of quarantine and a 46% increase in odds of a COVID-19 diagnosis. More

frequent drinking for social motives was associated with increased likelihood of quarantine, and more frequent drinking for conformity motives was associated with increased likelihood of a COVID-19 diagnosis. Neither enhancement motives nor coping motives were associated with either outcome.

As compared to participants who never or seldom drank alone or with a small group of friends, those who drank occasionally or frequently in these contexts were about half as likely to have quarantined since the semester started (see Table 3). Those who occasionally or frequently drank with a large group of friends were almost twice as likely to have quarantined than those who never or seldom drank in this context. Only one alcohol use context was associated with receiving a COVID-19 diagnosis. Compared to students who never or seldom drank at a bar or nightclub, those who drank occasionally or frequently in this context had almost three times the odds of a COVID-19 diagnosis.

DISCUSSION

This study examined the relationship between alcohol use behavior, motives, and context with COVID-19 among college students, adding to the growing literature on risk factors for COVID-19. Frequent alcohol use and drinking for social and conformity motives and in particular contexts (i.e., with a large group of friends, at a bar or nightclub) were linked to increased likelihood of COVID-19 exposure and diagnosis. Of note, students who drank often in settings that could be deemed less risky in the context of the pandemic, such as alone or with a small group of friends, were less likely to have had to quarantine during the semester.

These findings suggest that alcohol users with particular drinking habits might be a subgroup of the college student population at increased risk for COVID-19, as interpersonal drinking motives and social drinking contexts can potentially place students in high-risk environments for disease spread. Additionally, the positive association found between alcohol use frequency and both quarantine and COVID-19 diagnosis might suggest that frequent drinkers are more likely to be exposed to COVID-19 or could reflect a behavioral response to experiencing the COVID-19 outcomes explored in this study. Students might benefit from messaging encouraging them to avoid or limit their alcohol consumption during the COVID-19 pandemic, which is an existing recommendation for the general population [9]. Campuses should provide opportunities for social engagement and interaction that does not involve alcohol use and takes place virtually or while following public health guidelines, and behavioral health services should be readily available for students during the course of the pandemic. Coupling alcohol use and COVID-19 prevention efforts and related services has the potential to mitigate the spread and impact of COVID-19 on college campuses.

This study has several notable limitations. Assessments of health and substance use are subject to social desirability and recall biases. Given the rapidly changing nature of the pandemic, results of this study should be considered in the context of when and where the study took place. Data was collected at a single university and results may not be generalizable to students at other universities with unique institutional characteristics and responses to the COVID-19 pandemic. The study sample might not reflect the campus population, as it only included undergraduate student drinkers and had a higher proportion of female students and upperclassmen than the total undergraduate student population. COVID-19 testing history was not assessed, and the prevalence of positive COVID-19 diagnoses reported in this study is likely an underestimation of true COVID-19 prevalence. Date of COVID-19 diagnosis was not measured, which may be linked to study variables such as prevention behaviors and alcohol use context. Lastly, the cross-sectional study design did not allow for exploration of directionality. This research should be replicated in multi-campus studies with larger sample sizes such as the Healthy Minds Study [18], and future research should include other measures of alcohol use such as heavy episodic and high intensity drinking.

This study underscores the need for universities to continue to follow guidelines from the Centers for Disease Control and Prevention on how higher education institutions can reduce COVID-19 spread [10]. Students should be encouraged to limit in-person social interaction and avoid public spaces unrelated to academics. Policies should be in place to ensure compliance with public health protocols both on campus and in the community, such as in local restaurants and bars. As vaccination efforts continue and restrictions are lifted, universities must remain vigilant to promote campus and community health while using lessons learned to bolster planning for future threats to campus health and functioning.

Compliance with Ethical Standards

Authors' Statement of Conflict of Interest and Adherence to Ethical Standards: The authors declare that they have no conflicts of interest.

Human Rights: All procedures performed were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Study approval was obtained by the University of Mississippi's Institutional Review Board.

Informed Consent: Informed consent was obtained from all individual participants included in the study.

Welfare of Animals: This article does not contain any studies with animals performed by any of the authors.

Transparency Statement: This study was not formally registered. The analysis plan was not formally pre-registered.

Data Availability: De-identified data from this study are not available in a public archive. De-identified data from this study will be made available (as allowable according to institutional IRB standards) by emailing the corresponding author. Analytic code used to conduct the analyses presented in this study are not available in a public archive. They may be made available by emailing the corresponding author. Materials used to conduct this study are not publicly available. They may be made available by emailing the corresponding author.

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