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The Impact of Binge Drinking among Brazilian University Students on Mental Health and Quality of Life: A Post-COVID-19 Pandemic Study

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Abstract

Background: The restrictive lockdown measures that were introduced as a response to the COVID-19 pandemic imposed constraints that affected university students' drinking habits and mental health. **Methods:** The current study evaluated the rate of binge drinking among university students as they returned to normal life post-lockdown and whether binge drinking affected their mental health and quality of life. A cross-sectional study included 1382 university students (18 - 24 years) of one private Southwestern university in Brazil. Alcohol Use Disorders Identification, the Beck Depression Inventory-II, and the World Health Organization Quality of Life Brief were used. Data were collected after the COVID-19 pandemic lockdown period (from October 2021 to May 2022). **Results:** 52.6% of the students reported binge drinking, and 35.6% reported symptoms of depression. Binge drinkers were 1.41 times more likely to experience depressive symptoms when compared with non-binge drinkers, and binge drinking was a risk factor for lower quality of life in all three domains (physical, psychological and environmental). **Conclusion:** Our study highlights an increased prevalence of binge drinking in university students after the pandemic lockdown. The rise in binge drinking rates was linked to depressive symptoms and worsening of quality of life.

Keywords

Binge Drinking, COVID-19, Quality of Life, Depression, Prevalence, University Students

1. Introduction

The consequences of binge drinking are a major public health problem worldwide. Binge drinking is usually defined as the consumption of ≥4 drinks for females and ≥5 drinks for males per occasion within the past 2 weeks or 30 days (1 drink ~ 12 - 14 grams of ethanol) [1].

Binge drinking is now common among young people, with prevalence rates varying according to consumption patterns, but globally this phenomenon has been getting greater attention post-COVID [1]-[3]. Importantly, recent research has shown a rise in the rates of binge drinking [3] [4], and there are differences between the genders [1] [5], and increase in the number of drinks and intensity per binge drinking episode [6] [7].

There are immediate negative consequences associated with binge drinking which include road traffic accidents and accidents or injuries in which alcohol was a factor [1] [8]. However, over time, binge drinking may have a marked impact on health outcomes [9], and can negatively impact the mental health of university students in their late teens, and early twenties [10].

Contemporary research in Brazil indicates that alcohol abuse during young adulthood is a predictor of depressive symptoms in later adulthood [11] [12]. Prior studies employing the Beck Depression Inventory have demonstrated associations between depressive symptoms and alcohol consumption, particularly among heavy and problematic drinkers [13]. Binge drinking is linked to an increased risk of depressive symptoms during young adulthood, a critical period when many mental health disorders emerge [12]. Consequently, binge drinking may serve as a predictor of depression [11].

Depressive disorder is a common mental health, debilitating condition that affects individuals and society, in its most severe forms and is responsible for high rates of disability and premature death worldwide [14]. A persistent state of depressed mood is a characteristic symptom of depression, which is accompanied by fatigue, decreased interest or pleasure, impaired sleep, concentration difficulties, change in appetite, and other symptoms that together promote a negative effect on the well-being and quality of life [15] [16]. Binge drinking is associated with poor quality of life mostly due to its negative impact on mental health [17], generally the greater the intensity of consumption, the greater the damage to the quality of life [18].

The COVID-19 pandemic had significant impacts on drinking habits and mental health [11]. Studies examining alcohol consumption in the general population during the pandemic have reported increases in quantity and frequency of alcohol use [19] [20], while decreased consumption of alcohol was found among university students [21] [22]. Return to normal academic activities after the pandemic required readjustments since a large number of students were still suffering the negative consequences of the lockdown. Thus, it is of interest to evaluate the rate of binge drinking after the return to normal activities and whether this pattern of alcohol consumption affected mental health and quality of life during the period

of readaptation to campus life.

While numerous studies have examined the impact of binge drinking on young adults' health, there is limited information about the effect of binge drinking on depressive symptoms and the quality-of-life post-pandemic. The current study evaluated whether binge drinking was associated with depressive symptoms and the quality of life in young university students who had recently returned to university after the pandemic lockdown.

2. Material and Methods

2.1. Ethics

The study was approved by the Ethics Committee of the University Board (Protocol No. 3.897.416), according to Brazilian Resolution 466/2012, all participants signed the Free and Informed Consent Form.

2.2. Design, Participants, Location and Time

The study was a cross-sectional study, carried out following the guidelines recommended by Reporting of Observational Studies in Epidemiology (STROBE) [23].

A total of 1438 university students were recruited from one private Southwestern university in Brazil. A total of 56 students did not answer the questionnaires properly (e.g., missing questions, double-marked questions) and, for this reason, were excluded. The sample was composed of 1382 university students (18 - 24 years) from different academic years of 32 courses. Students were recruited via flyers and email communication. Normal university activities returned in September 2021, a period in which Brazil recorded the lowest number of cases and deaths from COVID-19. Data was collected in the period immediately after the COVID-19 pandemic lockdown, between October 2021 and May 2022.

The inclusion criteria for the study were being a student enrolled in undergraduate courses at the university, attending university on the days of data collection, and being between 18 and 24 years old.

2.3. Questionnaires

The sociodemographic information collected related to sex, age, course, current financial situation, current place of residence, current stage of study, civil status and daily working hours (for those students who had a job).

The Alcohol Use Disorders Identification Test (AUDIT) was used to evaluate patterns of alcohol consumption among the participants. The AUDIT is a widely used instrument, in various contexts and populations, and is validated and translated into Brazilian Portuguese [24]-[26]. The version used in this study consisted of 10 questions, whose responses have a score ranging from 0 to 4. Therefore, the scores of the questionnaire range from 0 to a maximum of 40. The following classification for alcohol consumption was used: low-risk (scores ranging from 0 to 7), high-risk (scores ranging from 8 to 15), hazardous (scores ranging from 16 to 19) and probable dependence (scores ranging from 20 to 40) [24] [25]. A grouped

classification of AUDIT was also used in which subjects with a score of ≤7 were considered abstainers/moderate drinkers, while heavy drinking was identified in subjects with a score of ≥8. Scores different from 0 (1 to 4) in question 3 of the AUDIT were used to identify binge drinkers [24] [26]. The AUDIT has consistent psychometric qualities in the original and abbreviated versions [24]-[26].

A visual calendar along with a written display of standard drink conversions was provided for each participant before completing the AUDIT. A standard drink was defined as one containing 14 g of alcohol, which is equivalent in Brazil to 340 ml of beer, 90 ml of red wine or 40 mL of spirits [24].

Depressive symptoms were assessed with the Beck Depression Inventory-II (BDI-II). The BDI-II consists of 21 sets of statements about depressive symptoms in the last 15 days. Each item is rated on a 0 to 3 ordinal scale, yielding total scores that range from 0 to a maximum of 63. The sum score of responses was used to categorize different levels/degrees of symptoms as follows: minimal/no depression (0 - 9 points), mild depression (10 - 16 points), moderate depression (17 - 29 points) or severe depression (30 - 63) [27]. A dichotomous measure, with a cut-off point score of at least 10 points, was used to represent no symptoms. Scores of ≥11 points were used to identify cases of depression. A validation study of the BDI involving university students and adults from the community showed good psychometric indices, with internal consistency (Cronbach's alpha = 0.93) and an intraclass correlation coefficient of 0.89. Considering the cutoff point of 10/11, to detect depression, presenting a sensitivity of 70% and a specificity of 87% [27].

The quality of life was evaluated using the Brazilian version of the World Health Organization Quality of Life Scale-Brief (WHOQOL-Bref), which was previously validated in Brazil [28]. The questionnaire consists of 26 questions grouped into the following quality of life domains: physical health, psychological, social and environmental [28]. The WHOQOL-Bref has been validated for its psychometric properties with the Brazilian population, with good internal consistency, with Cronbach's alpha ranging from 0.77 to 0.91 on the total scale; discriminant validity, criterion validity, concurrent validity, and test-retest reliability between its domains [28]. Raw values were transformed into scores from 0 to 100 points.

2.4. Statistical Analysis

Descriptive statistics (percentages and means) were calculated for sociodemographic and other quantitative variables including classification of alcohol consumption, levels/degrees of depressive symptoms and quality of life domains. Possible relations between sociodemographic variables and binge drinking were analysed using the Chi-square test (χ^2). The same test was used to analyse relations among sociodemographic variables, alcohol consumption and levels/degrees of depressive symptoms. Correlation analysis of the data was performed using Fisher's exact test. Kruskal–Wallis, a nonparametric statistical test, was used to detect relations between patterns of alcohol consumption (abstainers/low-risk drinking, high-risk/hazardous drinking and binge drinking) and quality of life domains. Relations between sociodemographic variables and quality of life domains were also

analysed by the Kruskal-Wallis test. All analyses were performed using the Statistical Package for the Social Science—version 20 [29].

Statistical significance between particular variables was tested using multivariable linear regression models. For each of the variables, a column was created with the corresponding quantity. Subsequently, the quantities were divided by the median (above the median/less than or equal to the median) and were used as a dependent variable in the study. The role of potential mediators (e.g., coping strategies, social support) or moderators (e.g., gender and living arrangements) was not explored. The respective odds ratio (OR) with their respective confidence interval (CI) of 95% were also calculated for the final models. In all analyses, the significance level adopted was 5% (alpha = 0.05). R Core Team [30], a language and environment for statistical computing was used in regression models.

3. Results

Sample Characterization

Among all 1382 participants, the mean age was 21 ± 2 years (mean ± standard error). The majority of the students were female (52.8% vs. 47.2% males), most were single (85.1%) and lived with their parents (73.3%). The Biological Sciences were the most common field of academic study (54.6%), followed by Physical Sciences (23.5%) and Social Sciences (21.9%). Most of the students had a job (71.6% vs. 28.4% without a job) with a working day of 8 hours (37.6%).

In the total sample, 66.7% of the students were low-risk drinkers, 26.8% were high-risk drinkers, 3.0% reported hazardous consumption and 3.4% were reporting probable dependence (AUDIT). The prevalence of binge drinking among students was 52.6%. In the dichotomous analyses, 66.8% of the students were abstainers/moderate drinkers, while 33.2% were heavy drinkers (AUDIT).

Regarding the levels of depression (BDI-II), the prevalence rates were 57.7% minimal/no depression, 25.9% mild, 13.5% moderate and 2.9% severe depression. A dichotomous analysis (BDI–II) showed that 35.6% of the students reported symptoms of depression.

Values of mean scores of the WHOQOL-Brief were correlated to sociodemographic variables; male students showed higher scores for the physical (73), psychological (68.4) and environmental (66.7) domains when compared with females (67.3, 62.8 and 65.1, respectively). Regarding civil status, married students showed a better quality of life than single students (score 69.8) in the physical domain (score 70.6). Students living with their spouses showed higher scores in the psychological domain (67.5) compared with those living with their parents (64.9), life partners (66.5), alone (66.6) or with friends (65.0). Students who did not have a job showed higher scores in the social (69.5) and environmental (69.3) domains compared with those who had a job (69.0 and 64.5, respectively). Regarding the field of academic study, students of the Biological Sciences showed a better quality of life in the psychological (score 65.9) and environmental domains (score 66.3) compared with students of Physical Sciences (scores 65.7 and 67.1. respectively)

and Social Sciences (scores 63.9 and 65.5. respectively).

Relations between sociodemographic variables and alcohol consumption

Binge drinkers were predominantly male (56.4%), single (55.3%), lived with their partners (65.6%), employed (54.5%), and full-time (8 hours) (55.9%) (Table 1). Binge drinking was more frequent in Physical Science students (55.1%) who were in the first 2 years of their courses (56.3%). All students who were classified as hazardous drinkers consumed alcohol in the binge drinking pattern. Most high-risk drinkers (94.3%) were also binge drinkers. Those students classified as probable dependent were also binge drinkers (Table 1).

Table 1. Relation between sociodemographic characteristics and binge drinking among college students.

	Binge drinking [n (%)]			
	No	Yes	Qui-square test	p-value
	655 (47.4%)	**727 (52.6)**		
Gender			$\chi^2(1) = 7.29$	**0.007**
Female	371 (50.8)	359 (49.2)		
Male	284 (43.6)	**368 (56.4)**		
Marital status			$\chi^2(1) = 23.29$	**0.001**
Married	129 (62.9)	76 (37.1)		
Single	526 (44.7)	**651 (55.3)**		
Living with			$\chi^2(4) = 39.38$	**0.001**
Parents	447 (44.1)	566 (55.9)		
Spouse	114 (68.3)	53 (31.7)		
Life partner	22 (34.4)	**42 (65.6)**		
Alone	53 (51)	51 (49)		
Friends	19 (55.9)	15 (44.1)		
Job			$\chi^2(1) = 4.78$	**0.029**
Yes	448 (45.5)	**536 (54.5)**		
No	207 (52)	191 (48)		
Working day			$\chi^2(4) = 4.75$	0.314
4 h	34 (49.3)	35 (50.7)		
6 h	132 (47.1)	148 (52.9)		
8 h	229 (44.1)	**290 (55.9)**		
12 h	59 (48.4)	63 (51.6)		
Do not work	201 (51.3)	191 (48.7)		

Continued

Field of knowledge			$\chi^2(2) = 6.78$	**0.034**
Biological Sciences	346 (45.8)	409 (54.2)		
Physics Sciences	146 (44.9)	**179 (55.1)**		
Social Sciences	163 (54)	139 (46)		
Graduating year			$\chi^2(2) = 10.77$	**0.005**
1st and 2nd	342 (43.7)	**441 (56.3)**		
3rd and 4th	279 (51.7)	261 (48.3)		
5th	34 (57.6)	25 (42.4)		
AUDIT classification			$\chi^2(3) = 506.33$	**0.001**
Low-risk	634 (68.7)	289 (31.3)		
High-risk	0 (0)	**41 (100)**		
Hazardous	21 (5.7)	**350 (94.3)**		
Probable dependence	0 (0)	**47 (100)**		
Grouped AUDIT (score of ≥8)			$\chi^2(1) = 575.79$	**0.001**
No	655 (69.3)	290 (30.7)		
Yes	0 (0)	**437 (100)**		

Note: Chi-square (χ^2) test/Fisher's test. (p-value < 0.05). N = 1382.

Relations between depressive symptoms and alcohol consumption

Analysis of possible interactions between depressive symptoms and alcohol consumption revealed that among the university students who had depressive symptoms, 68.1% were classified as probable alcohol dependent, 43.2% were heavy drinkers and 38.5% binge drunk alcohol (Table 2).

Table 2. Sociodemographic characteristics, binge drinking and depressive symptoms among college students.

	Depressive symptoms [n (%)]			
	Yes	**No**	**Qui-square**	**p-value**
	492 (35.6%)	**890 (64.4%)**		
Gender			$\chi^2(1) = 26.93$	**0.001**
Female	**306 (41.9)**	424 (58.1)		
Male	186 (28.5)	466 (71.5)		
Marital status			$\chi^2(1) = 4.88$	**0.027**
Married	59 (28.8)	146 (71.2)		
Single	**433 (36.8)**	744 (63.2)		

Continued

Living with			$\chi^2(4) = 3.7$	0.448
Parents	375 (37)	638 (63)		
Spouse	52 (31.1)	115 (68.9)		
Life partner	19 (29.7)	45 (70.3)		
Alone	34 (32.7)	70 (67.3)		
Friends	12 (35.3)	22 (64.7)		
Job			$\chi^2(1) = 0$	0.969
Yes	350 (35.6)	634 (64.4)		
No	142 (35.7)	256 (64.3)		
Working day			$\chi^2(4) = 0.79$	0.940
4 h	25 (36.2)	44 (63.8)		
6 h	94 (33.6)	186 (66.4)		
8 h	186 (35.8)	333 (64.2)		
12 h	46 (37.7)	76 (62.3)		
Do not work	141 (36)	251 (64)		
Field of knowledge			$\chi^2(2) = 9.71$	**0.008**
Biological Sciences	267 (35.4)	488 (64.6)		
Physics Sciences	98 (30.2)	227 (69.8)		
Social Sciences	**127 (42.1)**	175 (57.9)		
Graduating year			$\chi^2(2) = 1.98$	0.372
1st and 2nd	269 (34.4)	514 (65.6)		
3rd and 4th	198 (36.7)	342 (63.3)		
5th	25 (42.4)	34 (57.6)		
AUDIT classification			$\chi^2(3) = 38.06$	**0.001**
Low-risk	287 (31.1)	636 (68.9)		
High-risk	153 (41.2)	218 (58.8)		
Hazardous	20 (48.8)	21 (51.2)		
Probable dependence	**32 (68.1)**	15 (31.9)		
AUDIT (score of ≥8)			$\chi^2(1) = 16.31$	**0.001**
No	303 (32.1)	642 (67.9)		
Yes	**189 (43.2)**	248 (56.8)		
Binge drinking			$\chi^2(1) = 5.68$	**0.017**
No	212 (32.4)	443(67.6)		
Yes	**280 (38.5)**	447 (61.5)		

Note: Chi-square (χ^2) test/Fisher's test (p-value < 0.05). N = 1382.

Relations between quality of life and alcohol consumption

Low-risk drinkers showed better scores for quality of life in the physical domain (71.6) when compared with students classified as probable dependents (59.3). Similarly, non-binge drinkers showed better scores in the physical domain (71.6) when compared with binge drinkers (68.5) (Table 3).

Table 3. Relation between alcohol consumption and quality of life.

	WHOQOL domains	AUDIT classification	*n*	Mean	K.Wallis	p-value
AUDIT classification	Physical	Low-risk	923	**71.6**	24.6	**<0.001**
		High-risk	41	69.6		
		Hazardous	371	67.2		
		Probable dependence	47	**59.3**		
	Psychological	Low-risk	921	66.6	1.5	0.220
		High-risk	41	64.4		
		Hazardous	369	63.3		
		Probable dependence	47	59.9		
	Social	Low-risk	923	69.7	0.0	0.791
		High-risk	41	67.6		
		Hazardous	371	68.6		
		Probable dependence	47	63.8		
	Environmental	Low-risk	923	**66.8**	14.7	**0.002**
		High-risk	41	61.4		
		Hazardous	371	64.5		
		Probable dependence	47	**61.0**		
AUDIT (score of ≥8)	Physical	No	945	71.3	2.6	0.101
		Yes	437	67.1		
	Psychological	No	943	66.4	5.8	0.052
		Yes	435	63.3		
	Social	No	945	69.6	4.5	0.333
		Yes	437	68.2		
	Environmental	No	945	66.6	2.1	0.3467
		Yes	437	64.1		
Binge drinking	Physical	No	655	**71.6**	50.6	**<0.001**
		Yes	727	68.5		
	Psychological	No	653	67.0	0.2	0.617
		Yes	725	64.0		
	Social	No	655	69.1	0.9	0.342
		Yes	727	69.2		
	Environmental	No	655	67.2	5.1	0.157
		Yes	727	64.7		

Note: Kruskal-Wallis test (p-value < 0.05). N = 1382.

Multivariable linear regression

Results of multivariable linear regression models for the relationship between

alcohol consumption and depressive symptoms revealed that binge drinkers were 1.41 times more likely to experience depressive symptoms when compared with non-binge drinkers (OR = 1.41; 95% CI = 1.12 - 1.76, p < 0.005). Most importantly, binge drinking was identified as a risk factor for lower quality of life across the physical, psychological and environmental domains. Regarding the physical domain, binge drinkers showed scores that were 0.13 less than those found for non-binge drinkers. In addition, students who were binge drinking were 79.9% less likely to achieve maximal scores in this domain (Table 4). In the psychological domain, binge drinkers showed scores that were 0.16 less than those found for non-binge drinkers. Similarly, binge drinkers showed scores that were 0.08 less than those found for non-binge drinkers in the environmental domain. Students who binge drank were 66.4% less likely to achieve maximal scores in this domain. Conversely, binge drinking did not influence the social domain (Table 4), potentially because binge drinking is a component of social behaviour and is accepted among young people, as part of normal socialization.

Table 4. Multivariable linear regression models relating binge drinking and WHOQOL domains.

WHOQOL domains	Estimate	Standard error	t-value	p-value
Physical	−0.13	0.04	−3.24	**0.001**
Psychological	−0.16	0.04	−3.68	**<0.001**
Environmental	−0.08	0.03	−2.30	**0.021**
Social	0.01	0.04	0.25	0.795

Note: p-value < 0.05.

4. Discussion

Around one-third of the university students who had recently returned to campus life were engaged in an abusive pattern of alcohol use (AUDIT). An important highlight was that all the hazardous drinkers and those classified as probable dependent drinkers also binge drunk. In addition, most high-risk drinkers (94.3%) were also binge drinkers, showing a strict relationship between alcohol abuse and binge drinking. Most importantly, 52.6% of the students were binge drinkers, which is a high prevalence when compared to studies conducted before the pandemic lockdown. Studies conducted before the pandemic show that the prevalence of binge drinking among university students ranged from 30% and 40% in different countries [5] [31]-[35].

The present analysis of interactions between alcohol consumption and sociodemographic variables revealed that most binge drinkers were single or were living with life partners, suggesting that these two conditions are risk factors for this pattern of alcohol consumption. As described, students without family obligations (e.g., living with parents) and in a less controlled environment (e.g., living alone or with roommates) are more likely to consume higher quantities of alcohol more frequently [36]. In addition, we found that students who had a job were more

likely to binge drink. A study identified that having disposable income was a factor contributing to binge drinking, noting that young adults with money available on weekends were more likely to engage in binge drinking [37].

During COVID-19 pandemic lockdown, while there were increased rates of binge drinking in the general population [19] [20], there was a decrease in binge drinking among young university students [21] [22] [38]-[40]. Restricted possibilities to socialize were a major factor associated with a reduced rate of binge drinking among students during lockdown. Moreover, most of the students were living with their parents during this period, a factor that also diminishes binge drinking [22] [40]. In Brazil, during the COVID-19 pandemic, measures were implemented by the federal and regional governments to slow down the spread of the SARS-CoV-2 virus. These measures included social distancing measures, mandatory home quarantine, restrictions on mobility and closure of the educational system. They imposed environmental, contextual, and social constraints on the population, leading to changes to daily life activities and social interactions, which affected drinking habits and mental health.

To comply with social distancing guidelines, several universities, including the one at which this study was conducted, closed their campuses and moved classes online. Normal student life returned in September 2021 and the results of the present study were obtained after the COVID-19 pandemic lockdown period. Thus, we may conclude that the easing of pandemic lockdown restrictions had an impact on the prevalence of binge drinking. The possibility of socializing and anxiety symptoms due to fear of contamination and return to normal life were factors that contributed to the high prevalence of binge drinking in this study.

The prevalence of binge drinking among male students is high [4] [5] [35]. In the United States, around half of young men engaged in binge drinking; 57.4% in 2002 and 56.1% in 2012 [5]. Studies conducted in Brazil and France detected a rate of binge drinking of 52.8% [35] and 55.9% [4] among male university students. Importantly in our study, 49.4% of the binge drinkers were women, again demonstrating that the differences in male and female drinking patterns have narrowed. A previous study revealed that the prevalence of binge drinking among women in the United States increased from 44.9% in 2002 to 48.3% in 2012 [5]. It is worth noting that the prevalence of binge drinking among female students in France was 51.9% [4], compared to 44.1% in Brazil [35]. Given the high prevalence of mood disturbances and alcohol use during young adulthood (18 - 25 years) these conditions often co-occur in this population and it has been hypothesized that they may be associated [41]. The current study identified that among the participants with depressive symptoms (BDI–II), 38.5% binge drank alcohol.

Another important finding was that depressive symptoms were associated with the intensity of alcohol consumption since 68.1% of the students with depressive symptoms were classified as probable dependents (AUDIT). Thus, our results corroborate the findings of studies that describe a link between alcohol consumption and depression as confined to heavy and/ or binge drinkers [13].

Furthermore, our findings indicated that binge drinkers were 1.41 times more

likely to exhibit depressive symptoms compared to non-binge drinkers, thus confirming that binge drinking may contribute to development of mental distress.

In our study, 35.6% of the participants had depressive symptoms and were binge drinkers, which was higher than the figures reported before the pandemic (18.2%) [42]. Similarly, the classification of depressive symptoms revealed prevalence of 25.9%, 13.5%, and 2.9% for mild, moderate, and severe symptoms, respectively, accounting for a total of 42.3%. In contrast, in Spain, much lower prevalence of 9.1%, 2.3%, and 1.1% were observed among students, resulting in a total of 12.5% [42]. Likewise, the French study indicated that 19.8% of university students who were binge drinkers exhibited moderate to severe depression (BDI) [4].

The elevated percentage of binge drinkers experiencing depressive symptomatology in the present study may be linked to the rise in binge drinking rates, as higher levels of alcohol consumption are known to increase the risk of depression [43].

Binge drinking is associated with heightened negative emotional states and, therefore depressive symptoms that can negatively impact the quality of life of binge drinkers. The current study identifies that binge drinking was a risk factor for lower quality of life in the physical, psychological and environmental domains.

Among different populations alcohol misuse impairs the quality of life [15] [44]. Heavy drinkers show a worsening quality of life [45], but similar findings are also described for binge drinkers [17] [46]. As regards university students, studies have shown that binge drinking impaired their quality of life [15] [47]. However, the use of distinctive questionnaires to evaluate the quality of life among students limits the comparison among different studies. To the best of our knowledge, there are no studies evaluating the relationship between binge drinking, depressive symptoms and quality of life (WHOQOL). The reduced quality of life detected in our study may be the result of an increased prevalence of binge drinking and especially, of depressive symptoms since depression is described as lowering the quality of life [16].

It is important to note that these results provide important elements for the development of institutional policies aimed at promoting health and mental health at universities, in addition to important aspects for harm reduction practices. Therefore, establishing policies that allow new perspectives that expand life skills related to health behaviours, aiming to improve the quality of life for students, and minimizing the impacts on mental health, such as depression and alcohol abuse. Such policies would go beyond reducing vulnerability and risks among students, but also expand and strengthen the general well-being of the university community [11] [15].

5. Limitations of Study

The study has limitations that should be considered. First, all data about alcohol consumption, depressive symptoms and the quality of life were self-reported. We tried to minimize this issue using standardized questionnaires to improve the

reliability of the results. Second, the variables evaluated (binge drinking, quality of life and depressive symptoms) may influence each other mutually. Third, a cause-and-effect relation could not be determined in our study since binge drinking may have negative consequences on quality of life, but the poor quality of life may also lead to binge drinking. The same rationale would be applied to depressive symptoms and binge drinking. Nonetheless, our findings highlight the connection between binge drinking and depressive symptoms as well as binge drinking and worsening of quality of life. Finally, the sample is representative of one region of Brazil, which is a multicultural country with particular regional characteristics.

The strength of the study is that we examined the prevalence of binge drinking soon after the pandemic lockdown, showing that rates of binge drinking increased considerably when compared to studies that analyzed these parameters during or before the COVID-19 pandemic. Moreover, a high prevalence of depressive symptoms was observed among university students who binge drank.

6. Conclusion

Our study highlights the high rates of binge drinking in university students after the pandemic lockdown. Binge drinking was linked to depressive symptoms and worsening of quality of life. In light of our findings, screenings for alcohol abuse and depression should be done more frequently in the post-pandemic era to help build healthy coping and harm reduction strategies in the universities, mindful of the well-being and quality of life among these students. Moreover, more research is needed to understand the reasons behind the high binge drinking rates among students post-pandemic.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Centers for Disease Control and Prevention [CDC] (2024) Alcohol Use and Your Health. Division of Population Health, National Center for Chronic Disease Prevention and Health Promotion.

https://www.cdc.gov/alcohol/about-alcohol-use/index.html

[2] Pilatti, A., Cupani, M., Bravo, A.J., Mezquita, L., Read, J.P., Pautassi, R.M., *et al.* (2023) Utility of the Brief Young Adult Alcohol Consequences Questionnaire to Identify College Students At-Risk for Alcohol Related Problems: Relative Operating Characteristics across Seven Countries. *Substance Use & Misuse*, **58**, 1678-1690. https://doi.org/10.1080/10826084.2023.2238307

[3] Monds, L.A., Singleton, M.R. and Russell, A.M.T. (2023) The Effects of Binge Drinking on Attention in Young Adults. *Frontiers in Psychology*, **14**, Article ID: 1147621. https://doi.org/10.3389/fpsyg.2023.1147621

[4] Tavolacci, M., Boerg, E., Richard, L., Meyrignac, G., Dechelotte, P. and Ladner, J. (2016) Prevalence of Binge Drinking and Associated Behaviours among 3286 College Students in France. *BMC Public Health*, **16**, Article No. 178. https://doi.org/10.1186/s12889-016-2863-x

[5] White, A., Castle, I.P., Chen, C.M., Shirley, M., Roach, D. and Hingson, R. (2015) Converging Patterns of Alcohol Use and Related Outcomes among Females and Males in the United States, 2002 to 2012. *Alcoholism*: *Clinical and Experimental Research*, **39**, 1712-1726. https://doi.org/10.1111/acer.12815

[6] Valencia Martín, J.L., Galán, I., Segura García, L., Camarelles Guillem, F., Suárez Cardona, M. and Brime Beteta, B. (2020) Binge Drinking: The Challenges of Definition and Its Impact on Health. *Revista Espanhola de Salud Publica*, **94**, e202011170.

[7] Kanny, D., Liu, Y., Brewer, R.D., Lu, H. and CDC (2013) Binge Drinking—United States, 2011. *MMWR Supplements*, **62**, 77-80.

[8] Mundt, M.P., Zakletskaia, L.I. and Fleming, M.F. (2009) Extreme College Drinking and Alcohol-Related Injury Risk. *Alcoholism*: *Clinical and Experimental Research*, **33**, 1532-1538. https://doi.org/10.1111/j.1530-0277.2009.00981.x

[9] Chrystoja, B.R., Monteiro, M., Rehm, J. and Shield, K. (2022) Alcohol-Attributable Burden of Disease in the Americas in 2000 and 2016. *Journal of Studies on Alcohol and Drugs*, **83**, 45-54. https://doi.org/10.15288/jsad.2022.83.45

[10] Segheto, W., Domingues, S.F., Campos, B.R., Abreu, M.M.A. and Lima, L.M. (2023) Abusive Consumption of Alcoholic Beverages and Associated Factors in Brazilian University Students. *Health Education & Behavior*, **51**, 144-154. https://doi.org/10.1177/10901981231213584

[11] Moura, A.A.M.d., Bassoli, I.R., Silveira, B.V.d., Diehl, A., Santos, M.A.d., Santos, R.A.d., *et al.* (2022) Is Social Isolation during the COVID-19 Pandemic a Risk Factor for Depression? *Revista Brasileira de Enfermagem*, **75**, e20210594. https://doi.org/10.1590/0034-7167-2021-0594

[12] Pedrelli, P., Nyer, M., Yeung, A., Zulauf, C. and Wilens, T. (2014) College Students: Mental Health Problems and Treatment Considerations. *Academic Psychiatry*, **39**, 503-511. https://doi.org/10.1007/s40596-014-0205-9

[13] Geisner, I.M., Mallett, K. and Kilmer, J.R. (2012) An Examination of Depressive Symptoms and Drinking Patterns in First Year College Students. *Issues in Mental Health Nursing*, **33**, 280-287. https://doi.org/10.3109/01612840.2011.653036

[14] World Health Organization (2023) Depressive Disorder (Depression). https://www.who.int/news-room/fact-sheets/detail/depression

[15] Leaune, E., Vieux, M., Marchal, M., Combes, C., Crandall, S., Haesebaert, J., *et al.* (2022) Self-Reported Mental Health Symptoms, Quality of Life and Coping Strategies in French Health Sciences Students during the Early Stage of the COVID-19 Pandemic: An Online Survey. *L'Encéphale*, **48**, 607-614. https://doi.org/10.1016/j.encep.2021.09.002

[16] Fernandes, M.d.S.V., Mendonça, C.R., da Silva, T.M.V., Noll, P.R.e.S., de Abreu, L.C. and Noll, M. (2023) Relationship between Depression and Quality of Life among Students: A Systematic Review and Meta-Analysis. *Scientific Reports*, **13**, Article No. 6715. https://doi.org/10.1038/s41598-023-33584-3

[17] Perez-Araluce, R., Bes-Rastrollo, M., Martínez-González, M.Á., Toledo, E., Ruiz-Canela, M., Barbería-Latasa, M., *et al.* (2023) Effect of Binge-Drinking on Quality of Life in the "Seguimiento Universidad De Navarra" (SUN) Cohort. *Nutrients*, **15**, Article No. 1072. https://doi.org/10.3390/nu15051072

[18] Wen, X., Kanny, D., Thompson, W., Okoro, C., Town, M. and Balluz, L. (2012) Binge Drinking Intensity and Health-Related Quality of Life among US Adult Binge Drinkers. *Preventing Chronic Disease*, **9**, E86. https://doi.org/10.5888/pcd9.110204

[19] Tseng, H., Chung, S., Ananda, L., Kim, L. and Gutilla, M. (2023) Stress and Excessive Alcohol Consumption among Insured and Uninsured Adults during the COVID-19 Pandemic. *Journal of Public Health*, **32**, 1697-1706. https://doi.org/10.1007/s10389-023-01927-z

[20] Vu, T.T., Dario, J.P., Mateu-Gelabert, P., Levine, D., Punter, M.A., Borrell, L.N., *et al.* (2023) Alcohol Misuse, Binge Drinking, and Their Associations with Psychosocial Factors during COVID-19 among Harlem Residents in New York City. *Journal of Urban Health*, **100**, 638-648. https://doi.org/10.1007/s11524-023-00738-7

[21] Jaffe, A.E., Kumar, S.A., Ramirez, J.J. and DiLillo, D. (2021) Is the COVID-19 Pandemic a High-Risk Period for College Student Alcohol Use? A Comparison of Three Spring Semesters. *Alcoholism*: *Clinical and Experimental Research*, **45**, 854-863. https://doi.org/10.1111/acer.14572

[22] Rubio, M., van Hooijdonk, K., Luijten, M., Kappe, R., Cillessen, A.H.N., Verhagen, M., *et al.* (2023) University Students' (Binge) Drinking during COVID-19 Lockdowns: An Investigation of Depression, Social Context, Resilience, and Changes in Alcohol Use. *Social Science & Medicine*, **326**, Article ID: 115925. https://doi.org/10.1016/j.socscimed.2023.115925

[23] von Elm, E., Altman, D.G., Egger, M., Pocock, S.J., Gøtzsche, P.C. and Vandenbroucke, J.P. (2014) The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: Guidelines for Reporting Observational Studies. *International Journal of Surgery*, **12**, 1495-1499. https://doi.org/10.1016/j.ijsu.2014.07.013

[24] de Meneses-Gaya, C., Zuardi, A.W., Loureiro, S.R. and Crippa, J.A.S. (2009) Alcohol Use Disorders Identification Test (AUDIT): An Updated Systematic Review of Psychometric Properties. *Psychology & Neuroscience*, **2**, 83-97. https://doi.org/10.3922/j.psns.2009.1.12

[25] Cardoso, D.P., Oliveira, D., Antunes, B., Saraiva, R., Angus, K., Gallardo, E., *et al.* (2022) Portuguese Validated Versions of the Alcohol Use Disorders Identification Test: A Systematic Review Protocol. *Acta Médica Portuguesa*, **35**, 264-269. https://doi.org/10.20344/amp.15765

[26] Shakeshaft, A.P., Bowman, J.A. and Sanson-Fisher, R.W. (1998) Comparison of Three Methods to Assess Binge Consumption: One-Week Retrospective Drinking Diary, Audit, and Quantity/Frequency. *Substance Abuse*, **19**, 191-203. https://doi.org/10.1080/08897079809511387

[27] Gomes-Oliveira, M.H., Gorenstein, C., Neto, F.L. andrade, L.H. and Wang, Y.P. (2012) Validation of the Brazilian Portuguese Version of the Beck Depression Inventory-II in a Community Sample. *Revista Brasileira de Psiquiatria*, **34**, 389-394. https://doi.org/10.1016/j.rbp.2012.03.005

[28] Fleck, M.P., Louzada, S., Xavier, M., Chachamovich, E., Vieira, G., Santos, L., *et al.* (2000) Aplicação da versão em português do instrumento abreviado de avaliação da qualidade de vida "WHOQOL-bref". *Revista de Saúde Pública*, **34**, 178-183. https://doi.org/10.1590/s0034-89102000000200012

[29] IBM Corp (2019) IBM SPSS Statistics for Windows, Version 26.0. IBM Corp.

[30] R Core Team R (2022) A Language and Environment for Statistical Computing. R Foundation for Statistical Computing. http://www.R-project.org/

[31] Carbia, C., Cadaveira, F., Caamaño-Isorna, F., Rodríguez-Holguín, S. and Corral, M. (2017) Binge Drinking during Adolescence and Young Adulthood Is Associated with Deficits in Verbal Episodic Memory. *PLOS ONE*, **12**, e0171393. https://doi.org/10.1371/journal.pone.0171393

[32] Herrero-Montes, M., Alonso-Blanco, C., Paz-Zulueta, M., Sarabia-Cobo, C., Ruiz-Azcona, L. and Parás-Bravo, P. (2019) Binge Drinking in Spanish University Students: Associated Factors and Repercussions: A Preliminary Study. *International Journal of Environmental Research and Public Health*, **16**, Article No. 4822. https://doi.org/10.3390/ijerph16234822

[33] Krieger, H., Young, C.M., Anthenien, A.M. and Neighbors, C. (2018) The Epidemiology of Binge Drinking among College-Age Individuals in the United States. *Alcohol Research*, **39**, 23-30.

[34] Salas-Gomez, D., Fernandez-Gorgojo, M., Pozueta, A., Diaz-Ceballos, I., Lamarain, M., Perez, C., *et al.* (2016) Binge Drinking in Young University Students Is Associated with Alterations in Executive Functions Related to Their Starting Age. *PLOS ONE*, **11**, e0166834. https://doi.org/10.1371/journal.pone.0166834

[35] Sanchez, Z.M., Martins, S.S., Opaleye, E.S., Moura, Y.G., Locatelli, D.P. and Noto, A.R. (2011) Social Factors Associated to Binge Drinking: A Cross-Sectional Survey among Brazilian Students in Private High Schools. *BMC Public Health*, **11**, Article No. 201. https://doi.org/10.1186/1471-2458-11-201

[36] Wicki, M., Kuntsche, E. and Gmel, G. (2010) Drinking at European Universities? A Review of Students' Alcohol Use. *Addictive Behaviors*, **35**, 913-924. https://doi.org/10.1016/j.addbeh.2010.06.015

[37] Bartoli, F., Carretta, D., Crocamo, C., Schivalocchi, A., Brambilla, G., Clerici, M., *et al.* (2014) Prevalence and Correlates of Binge Drinking among Young Adults Using Alcohol: A Cross-Sectional Survey. *BioMed Research International*, **2014**, Article ID: 930795. https://doi.org/10.1155/2014/930795

[38] Vasconcelos, M., Crego, A., Rodrigues, R., Almeida-Antunes, N. and López-Caneda, E. (2021) Effects of the COVID-19 Mitigation Measures on Alcohol Consumption and Binge Drinking in College Students: A Longitudinal Survey. *International Journal of Environmental Research and Public Health*, **18**, Article No. 9822. https://doi.org/10.3390/ijerph18189822

[39] Vera, B.d.V., Carmona-Márquez, J., Lozano-Rojas, Ó.M., Parrado-González, A., Vidal-Giné, C., Pautassi, R.M., *et al.* (2021) Changes in Alcohol Use during the COVID-19 Pandemic among Young Adults: The Prospective Effect of Anxiety and Depression. *Journal of Clinical Medicine*, **10**, Article No. 4468. https://doi.org/10.3390/jcm10194468

[40] Jackson, K.M., Merrill, J.E., Stevens, A.K., Hayes, K.L. and White, H.R. (2021) Changes in Alcohol Use and Drinking Context Due to the COVID-19 Pandemic: A Multimethod Study of College Student Drinkers. *Alcoholism: Clinical and Experimental Research*, **45**, 752-764. https://doi.org/10.1111/acer.14574

[41] Cooper, M.L., Frone, M.R., Russell, M. and Mudar, P. (1995) Drinking to Regulate

Positive and Negative Emotions: A Motivational Model of Alcohol Use. *Journal of Personality and Social Psychology*, **69**, 990-1005. https://doi.org/10.1037//0022-3514.69.5.990

[42] Herrero-Montes, M., Alonso-Blanco, C., Paz-Zulueta, M., Pellico-López, A., Ruiz-Azcona, L., Sarabia-Cobo, C., *et al.* (2021) Relationship between Depressive Symptoms, Personality, and Binge Drinking among University Students in Spain. *Journal of Clinical Medicine*, **11**, Article No. 53. https://doi.org/10.3390/jcm11010053

[43] Boden, J.M. and Fergusson, D.M. (2011) Alcohol and Depression. *Addiction*, **106**, 906-914. https://doi.org/10.1111/j.1360-0443.2010.03351.x

[44] Saengcharnchai, P., Likhitsathian, S., Yingwiwattanapong, J., Wittayanookulluk, A., Uttawichai, K., Booncharoen, H., *et al.* (2015) Correlates of Health-Related Quality of Life in Thai Patients with Alcohol Dependence. *Journal of Ethnicity in Substance Abuse*, **15**, 210-220. https://doi.org/10.1080/15332640.2015.1022628

[45] Dişsiz, M., Beji, N. and Oskay, Ü. (2015) The Effects of Alcohol Dependence on the Quality of Life and Sex Life of Women. *Substance Use & Misuse*, **50**, 1373-1382. https://doi.org/10.3109/10826084.2015.1013129

[46] Lee, Y.Y., Wang, P., Abdin, E., Chang, S., Shafie, S., Sambasivam, R., *et al.* (2020) Prevalence of Binge Drinking and Its Association with Mental Health Conditions and Quality of Life in Singapore. *Addictive Behaviors*, **100**, Article ID: 106114. https://doi.org/10.1016/j.addbeh.2019.106114

[47] Dormal, V., Bremhorst, V., Lannoy, S., Lorant, V., Luquiens, A. and Maurage, P. (2018) Binge Drinking Is Associated with Reduced Quality of Life in Young Students: A Pan-European Study. *Drug and Alcohol Dependence*, **193**, 48-54. https://doi.org/10.1016/j.drugalcdep.2018.08.033