Psychiatric Comorbidities of Hazardous Alcohol Drinking in College Students

Bowon Choi, MD, Bo-Hyun Yoon, MD, PhD, Suhee Park, MD, Kyungmin Kim, MD,
Hangoeunbi Kang, MD, Young-Hwa Sea, MD, Jye-Heon Song, MD, Jungeun Bae, MD, Yuran Jeong, MD

Department of Psychiatry, Naju National Hospital, Naju, Korea

Background: Alcohol drinking among college students is socially permissible in Korea. However, this population's tendency to consume alcohol excessively results in many alcohol-related problems, including psychiatric problems. This study aimed to identify the sociodemographic characteristics and psychiatric comorbidities associated with hazardous alcohol drinking among college students.

Methods: In total, 2,571 college students participated in the study. Data were collected using the Korean version of the Alcohol Use Disorders Identification Test (AUDIT-K), the Mood Disorder Questionnaire, the Center for Epidemiologic Studies Depression Scale, a modified Korean version of the 16-item Prodromal Questionnaire, the Adult Attention-Deficit/Hyperactivity Disorder Self-Report Scale-Version 1.1, and a stress-coping scale. Logistic regression analysis was performed on variables significantly correlated with hazardous alcohol drinking.

Results: In total, 633 students were grouped into the hazardous alcohol drinking group (AUDIT-K, ≥ 12). The associated variables were age (odds ratio [OR], 0.95; $p < 0.05$), smoking (OR, 4.00; $p < 0.001$), bipolar disorder (OR, 2.45; $p < 0.05$), depressive disorder (OR, 1.35; $p < 0.05$), attention-deficit/hyperactivity disorder (ADHD; OR, 1.44; $p < 0.05$), and problem-focused stress coping (OR, 0.97; $p < 0.05$).

Conclusion: In this study, hazardous alcohol drinking was associated with smoking, mood disorders, and ADHD. We suggest that alcohol use among college students be carefully monitored and managed in terms of its psychiatric comorbidities.

Keywords Alcohol drinking; College student; Comorbidity; Mood disorders; Attention deficit hyperactivity disorder

INTRODUCTION

According to the World Health Organization (WHO) in 2016, more than half the adult population worldwide abstained from drinking. However, approximately 3 million people worldwide died from excessive drinking (5.3% of all deaths), and 132.5 million disability-adjusted life years, which mean the burden of diseases, were attributable to the harmful alcohol drinking [1]. As of 2016, WHO reported that the annual prevalence

of alcohol use disorder in Korea was 13.9% (21.2% for men, 6.8% for women). This was 2.7 times higher than the world average of 5.1% [1]. In Korea, easy access to alcohol and popular drinking culture have increased the prevalence of binge drinking and alcohol use disorder. Additionally, the socioeconomic cost of related problems was higher than that in other developed countries [2]. According to the survey of mental disorders in Korea, alcohol use disorder was the most common mental illness with a lifetime prevalence of 12.2% in 2016 [3].

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Correspondence: Bo-Hyun Yoon, MD, PhD

Department of Psychiatry, Naju National Hospital, 1328-31, Senam-ro, Sanpo-myeon, Naju 58213, Korea

TEL +82-61-330-4102 FAX +82-61-330-4155 E-mail yoonbh@chollan.net ORCID <https://orcid.org/0000-0002-3882-7930>

Co-Correspondence: Suhee Park, MD

Department of Psychiatry, Naju National Hospital, 1328-31, Senam-ro, Sanpo-myeon, Naju 58213, Korea

TEL +82-61-330-7731 FAX +82-61-330-4150 E-mail oakheart@hanmail.net ORCID <https://orcid.org/0000-0002-7366-8226>

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College life is the transitional period from adolescence to adulthood. College students are not as much under control of their parents, and as drinking is socially permitted, they are naturally exposed to drinking. In a study on alcohol drinking conducted on 5,024 college students in 2017, their monthly drinking rate was 75.4%, which was higher than the monthly drinking rate of 59.4% among adults [4]. Approximately 53.6% college students had a score of ≥ 8 on the Korean version of Alcohol Use Disorders Identification Test (AUDIT-K), which indicated hazardous alcohol drinking, harmful alcohol drinking, and alcohol dependence as defined by WHO [4,5]. This suggested that more half the population of college students was drinking excessively [4]. Alcohol use disorder caused by hazardous alcohol drinking can lead not only to personal health problems such as increased risk of various diseases but also social problems including car accidents, delinquency, suicide, and murder [6].

Previous studies have demonstrated that alcohol use disorder is related to sex, age, low education level, depressive symptoms, stress, and smoking [7]. Additionally, hazardous alcohol drinking is often associated with various psychiatric conditions. In particular, mood disorders, anxiety disorders, and other addiction disorders may be problematic [8]. According to the survey of mental disorders in Korea (2016), the risk of simultaneous depression, psychotic disorders, and anxiety disorder was 1.5 times higher in alcohol dependent patients than in the general population [3]. In most patients with depressive disorder, alcohol is mainly used to alter the depressed mood [9]. In patients with bipolar disorder, alcohol is used to enhance mood or calm intense excitement [10]. In addition, in patients with attention-deficit/hyperactivity disorder (ADHD) or those with anti-social personality disorder, impulsive tendencies lead to hazardous alcohol drinking and alcohol dependence [11,12].

Although many previous studies assessed hazardous alcohol drinking in college students, a few studies assessed the relationship between hazardous alcohol drinking and psychiatric comorbidities in this population [13-15]. Therefore, this study investigated hazardous alcohol drinking, related sociodemographic characteristics, and psychiatric status among college students to understand hazardous alcohol drinking, and evaluate its relationship with associated psychiatric comorbidities.

MATERIALS AND METHODS

1. Participants

Among 2,593 participants who agreed to complete a questionnaire and provide information in a mental health campaign conducted by the Naju National Hospital and Jeonnam Metropolitan Mental Health Welfare Center in 13 universities or colleges in region of Gwangju and Jeollanam-do from March 2018 to June 2018, 2,571 participants were finally included in this study. They were provided with detailed explanations of the study, and written consent was obtained from every participant. A self-reported questionnaire was used to evaluate sociodemographic factors and psychiatric comorbidities related to hazardous alcohol drinking. This study was approved by the Institutional Review Board of Naju National Hospital (approval number: NNH-HR-2020-3).

2. Evaluation tools

1) Sociodemographic factors

Sociodemographic factors such as age, sex, college year, years of education, marital status, living arrangement, marital status of parents, subjective socioeconomic status, and smoking were assessed.

2) Definition of hazardous alcohol drinking

AUDIT-K [16] was used to evaluate alcohol drinking behavior in college students. AUDIT is an alcohol use assessment tool developed by the WHO in 1989. And the tool consists of 10 items on the amount of alcohol consumed in the past year (3 items), drinking behavior (3 items), and related psychosocial problems (4 items) [5]. Each item was evaluated on a 5-point Likert scale ranging from 0 to 4 points. The total score ranged from 0 to 40, and a higher score indicated a higher probability of hazardous alcohol drinking. In this study, AUDIT-K was used. Cronbach's alpha for the tool was 0.92 [16]. As previously described [16,17], 12 points were used as the cut-off point for hazardous alcohol drinking. Participants with an AUDIT-K score ≥ 12 were defined as hazardous alcohol drinkers.

3) Mood Disorder Questionnaire

The Mood Disorder Questionnaire (MDQ), developed by Hirschfeld et al. [18] was used to screen for bipolar disorder. Those who satisfied the following three cri-

teria were considered to have bipolar disorder [18]: (1) answered yes to 7 or more items on symptoms of manic or hypomanic in the past; (2) symptoms appeared at the same time; and (3) symptoms caused moderate or severe problems. In this study, the same criteria was used to define the bipolar disorder group.

4) Center for Epidemiologic Studies Depression Scale

The Center for Epidemiologic Studies Depression Scale (CES-D) was used to evaluate depressive symptoms. CES-D is a self-reported depressive symptom scale [19], adapted in Korean and standardized in 1993 [20]. Cronbach's alpha for the scale was 0.91. In a previous study on the Korean version of CES-D, a score ≥ 21 was used as the cut-off point to screen for depression and had a sensitivity of 95.7% and specificity of 69.5% [20]. In this study, the same cut-off value was used to define the depressive disorder group.

5) Modified Korean version of the 16-item Prodromal Questionnaire

The modified Korean version of the 16-item Prodromal Questionnaire (mKPQ-16) was used to evaluate early psychosis. The mKPQ-16 is a self-reported evaluation scale with 19 items used to screen high-risk groups likely to develop psychosis in the general population [21]. The mKPQ-16 was developed by translating the 16-item version of the prodromal questionnaire (PQ-16) [22] and supplementing it with three more items on cognitive symptoms and related accidents [21]. The total score for the tool ranged from 0 to 19. A score ≥ 7 was used as the screening cut-off point [21]. In this study, participants with a score ≥ 7 were defined as the early psychosis risk group.

6) Adult Attention-Deficit/Hyperactivity Disorder Self-Report Scale-Version 1.1

The Adult Attention-Deficit/Hyperactivity Disorder Self-Report Scale-Version 1.1 (ASRS-v1.1) was used to screen for ADHD. The ASRS-v1.1 is a self-reported scale developed by WHO using the DSM-IV [23]. The tool was translated to Korean and standardized by Kim et al. [24]. ADHD was defined in those who satisfied 4 out of 6 items of Part A with a specificity of 99.5% and sensitivity of 68.7% [23]. The same criteria were used to define the ADHD group in this study.

7) Stress-coping scale

The stress-coping scale developed by Folkman and Lazarus originally consisted of 68 items [25] and is used to evaluate coping with stress in daily life. The tool was adapted, revised, and supplemented by Lee and Kim [26], and it included 62 items the following four factors: problem-focused coping, seeking social support, wishful thinking, and emotion-focused coping. Each item was evaluated on a 4-point Likert scale, ranging from "not at all" to "very much." A total of 24 items with 6 items from each of the 4 factors were selected out of the 62 items through the factor analysis [27]. Problem-focused coping and seeking social support were conceptualized as active coping, and wishful thinking and emotion-focused coping were conceptualized as passive coping. Cronbach's α was 0.92 [27]. In this study, Cronbach's α for the total 24 items was 0.94 and those of problem-focused coping, seeking social support, wishful thinking, and emotion-focused coping were 0.90, 0.87, 0.83, and 0.80, respectively.

3. Data analysis

SPSS 21.0 (IBM Corp., Armonk, NY, USA) was used for statistical analysis. Sociodemographic factors and psychiatric comorbidities were compared between hazardous alcohol drinking and normal groups. Chi-squared test and independent t-test were conducted to compare categorical and continuous variables, respectively. To identify risk and protective factors affecting hazardous alcohol drinking, logistic regression was conducted on sociodemographic factors and psychiatric scales that were significantly identified in chi-square test and independent t-test. A p-value < 0.05 was considered statistically significant, with a confidence interval [CI] of 95%.

RESULTS

1. Sociodemographic characteristics of hazardous alcohol drinking and normal groups

Among the 2,571 of participants, 633 (24.6%) had an AUDIT-K score ≥ 12 and were classified as the hazardous alcohol drinking group. The mean age of the hazardous alcohol drinking group was 19.7 years, which was lower than 20.1 years for normal group ($p < 0.05$). A total of 305

males and 328 females were included in the hazardous alcohol drinking group. There were no significant differences in sex distribution between the two groups. The proportion of current smokers in the hazardous alcohol drinking group was 31.8%, which was higher than that of 10.2% in normal group ($p<0.001$). There were no significant differences in other sociodemographic factors such as education years, the college year, marital status, living arrangement, marital status of parents, and self-perceived socioeconomic status between the two groups (Table 1).

2. Clinical characteristics related to mental health in hazardous alcohol drinking and normal groups

The proportion of the bipolar disorder group, depres-

sive disorder group, early psychosis risk group, and ADHD group was higher in the hazardous alcohol drinking group than in normal group ($p<0.001$). The hazardous alcohol drinking group showed a lower problem-focused coping score compared to normal group ($p<0.001$) (Table 2).

3. Sociodemographic and mental health-related influencing factors associated with hazardous alcohol drinking

Multivariate logistic regression analysis was conducted using variables that were significantly different in univariate analysis according to hazardous alcohol drinking in college students. As a result, variables that were significantly related to hazardous alcohol drinking were age (odds ratio [OR], 0.95; 95% CI, 0.91-

Table 1. Comparisons of sociodemographic factors considering hazardous alcohol drinking in college students

Variable	Hazardous drinking (n=633)	Normal (n=1,938)	p-value
Age (y)	19.7±2.4	20.1±4.2	<0.05
Sex			0.086
Male	305 (48.2)	858 (44.3)	
Female	328 (51.8)	1,080 (55.7)	
College year			0.136
1st	394 (62.2)	1,283 (66.2)	
2nd	114 (18.0)	335 (17.3)	
3rd	67 (10.6)	190 (9.8)	
4th	58 (9.2)	130 (6.7)	
Education (y)	13.0±1.4	12.9±1.5	0.436
Marital status			0.520
Married	14 (2.2)	52 (2.7)	
Others	619 (97.8)	1,886 (97.3)	
Living arrangement			0.597
Living with family	350 (55.3)	1,095 (56.5)	
Living alone	283 (44.7)	843 (43.5)	
Marital status of parents			0.067
Married	537 (84.8)	1,702 (87.8)	
Others	96 (15.2)	236 (12.2)	
SES			0.287
High	61 (9.6)	170 (8.8)	
Middle	488 (77.1)	1,550 (80.0)	
Low	84 (13.3)	218 (11.2)	
Smoking			<0.001
Non-current smoker	432 (68.2)	1,740 (89.8)	
Current smoker	201 (31.8)	198 (10.2)	

Values are presented as mean±standard deviation or number (%).

SES, self-perceived socioeconomic status.

Table 2. Comparisons of mental-health-related conditions among college students with hazardous alcohol drinking group and normal group

Variable	Hazardous drinking (n=633)	Normal (n=1,938)	p-value
Bipolar disorder			<0.001
MDQ non-responder	600 (94.8)	1,911 (98.6)	
MDQ responder	33 (5.2)	27 (1.4)	
Depressive disorder			<0.001
CES-D<21	506 (79.9)	1,711 (88.3)	
CES-D≥21	127 (20.1)	227 (11.7)	
Early psychosis			<0.001
mKPQ-16<7	532 (84.0)	1,738 (89.7)	
mKPQ-16≥7	101 (16.0)	200 (10.3)	
ADHD			<0.001
ASRS negative	532 (84.0)	1,764 (91.0)	
ASRS positive	101 (16.0)	174 (9.0)	
Stress coping ^a			
Problem focused	11.5±4.8	12.4±4.7	<0.001
Seek social support	11.9±4.7	12.2±4.7	0.236
Emotion focused	10.3±4.0	10.2±4.0	0.545
Wishful thinking	13.1±4.4	13.1±4.4	0.789

Values are presented as number (%) or mean±standard deviation.

MDQ, Mood Disorder Questionnaire; CES-D, Center for Epidemiologic Studies Depression Scale; mKPQ-16, modified Korean version of the 16-item Prodromal Questionnaire; ADHD, attention-deficit/hyperactivity disorder; ASRS, Adult Attention-Deficit/Hyperactivity Disorder Self-Report Scale.

^aStress-coping scale (SCS) was used. It was revised by Park [27] based upon the work of Lazarus and Folkman [25].

Table 3. Factors associated with hazardous alcohol drinking in college students

Variable	B	SE	OR (95% CI)	p-value
Age (y)	-0.06	0.02	0.95 (0.91-0.98)	<0.05
Smoking	1.39	0.13	4.00 (3.12-5.12)	<0.001
Bipolar disorder	0.9	0.31	2.45 (1.34-4.48)	<0.05
Depressive disorder	0.3	0.15	1.35 (1.01-1.79)	<0.05
Early psychosis	0.1	0.16	1.11 (0.81-1.52)	0.514
ADHD	0.36	0.16	1.44 (1.06-1.96)	<0.05
Problem-focused stress coping (score)	-0.03	0.01	0.97 (0.95-0.99)	<0.05

B, unstandardized beta coefficients; SE, standard error; OR, odds ratio; CI, confidence interval; ADHD, attention-deficit/hyperactivity disorder.

0.98; $p<0.05$), smoking (OR, 4.00; 95% CI, 3.12-5.12; $p<0.001$), bipolar disorder (OR, 2.45; 95% CI, 1.34-4.48; $p<0.05$), depressive disorder (OR, 1.35; 95% CI, 1.01-1.79; $p<0.05$), ADHD (OR, 1.44; 95% CI, 1.06-1.96; $p<0.05$), and problem-focused coping (OR, 0.97; 95% CI, 0.95-0.99; $p<0.05$) (Table 3).

DISCUSSION

This study aimed to investigate hazardous alcohol drinking in college students and identify related sociodemographic characteristics and psychiatric comorbidities to suggest the necessity of providing adequate interventions pertaining to drinking problem among college students.

In this study, a score of 12 was used as the AUDIT-K cut-off point, considering the permissive Korean

drinking culture and higher sensitivity and specificity, compared to 8 points of cut-off point [16]. In previous studies on drinking in college students using 12 points for AUDIT-K as the cut-off point, approximately 39.1% to 43.8% participants had hazardous alcohol drinking behaviors with a mean score of 12.3 to 19.3 for AUDIT-K [13-15]. In this study, 24.6% of college students presented with hazardous alcohol drinking behavior, and the mean AUDIT-K score was 8.32, which were both lower compared to the previous studies. This study was done relatively recently than previous studies so reasons of low prevalence and AUDIT-K scores could not be found elsewhere. Further studies may be needed to find out whether the tendency of alcohol drinking in college students is decreasing.

The mean age of the hazardous alcohol drinking group was lower than that of normal group, which was similar to the previous findings on the tendency of decreased hazardous alcohol drinking with increasing age [3]. However, in our study, there was no significant difference among the college year between the two groups. Previous studies showed inconsistent results on hazardous alcohol drinking according to the college year. While there was no significant difference in hazardous alcohol drinking according to the college year [4,13], hazardous alcohol drinking was high in third and fourth college year students [14] as well as in first college year [15].

Our study indicated that sex had no effect on hazardous alcohol drinking. In previous studies, male students showed higher hazardous alcohol drinking behavior than female students [4,13]. In contrast, other studies showed that sex had no significant effects on hazardous alcohol drinking [14,15], reporting inconsistent findings. According to National Statistics in Korea in 2016, the prevalence of alcohol use disorder in men was three times higher than that in women; however, there was no difference in the prevalence between men and women in their 20s [3]. This is in accordance with our findings in which the mean age of the participants was 20 years, and there were no differences in hazardous alcohol drinking between male and female students.

Smoking is associated with increased alcohol use, alcohol dependence, and high comorbidities [28]. Furthermore, in a study of college students, smokers had 1.95-times higher risk of hazardous alcohol drinking than nonsmokers [13]. Similarly, in our study, smokers had four-times higher relative risk of hazardous alcohol

drinking compared to non-smokers, confirming that comorbidities of substance use disorders such as smoking were related to hazardous alcohol drinking. Alcohol and nicotine are both associated with desensitization of nicotine receptors in the brain [19]. Both alcohol and nicotine also act on the reward system by increasing the activity of dopamine in the brain, especially the meso-corticolimbic dopamine system [28], which may explain the increased risk of hazardous alcohol drinking in smokers. Therefore, it is necessary to intervene in hazardous alcohol drinking and provide smoking cessation education to college students.

Another finding of this study was high association between hazardous alcohol drinking and bipolar disorder. In the hazardous alcohol drinking group, the relative risk for bipolar disorder was 2.45 times higher than in the normal group, confirming that hazardous alcohol drinking increases the risk of bipolar disorder. In the Epidemiologic Catchment Area (ECA) Study, patients with bipolar I disorder had alcohol use disorder for almost half of their lives, which was twice as high as in patients with other major depressive disorders [29]. In addition, patients with alcohol use disorder had 4.6-times higher risk of bipolar disorder than the general population [29]. Moreover, the National Epidemiologic Survey on Alcohol and Related Conditions reported 1.4- to 2.4-times higher risk of bipolar I disorder in alcohol use disorder patients, depending on the severity of disorder [30]. In Korea, a previous study compared hazardous alcohol drinking behaviors considering bipolar tendency. Hazardous alcohol drinking behavior, measured using AUDIT, was higher in the MDQ responder group than in the MDQ non-responder group [31].

Here, the depressive disorder risk group also had 1.35-times higher relative risk of hazardous alcohol drinking, indicating the relationship between hazardous alcohol drinking and depressive disorder. In previous studies on major depressive disorder, 32.5% of patients were diagnosed with alcohol dependence in their lifetime [9], and major depressive disorder doubled the risk of alcohol use disorder [32]. In the hazardous alcohol drinking group, the risk of bipolar disorder was higher than the risk of depressive disorder. These results support the finding that patients with bipolar tendencies have greater psychological discomfort from mood symptoms compared to patients with depressive disorder, and they drink alcohol to self-medicate; that is, attempting to reduce mood symptoms [9,10]. The relationship be-

tween bipolar tendency and hazardous alcohol drinking also suggests a biological commonality between bipolar disorder and alcohol use disorders. Abnormalities of the dopaminergic system in patients with bipolar disorder have been reported in several studies [33], which suggest that such abnormality may be related to the high propensity to seek sensations, which is observed in patients with alcohol dependence [34].

College students with hazardous alcohol drinking are more likely to have mood disorders; thus, early intervention is essential for future disease prognosis. Mood disorder must be evaluated together in college students with hazardous alcohol drinking behaviors.

Univariate analysis showed that hazardous alcohol drinking group had a higher risk of early psychosis; however, multivariate analysis showed no significant results. This may be related to a recent study, in which progression from substance-induced psychosis to schizophrenia is more likely to be related to family history of schizophrenia rather than being caused by the substance itself [35]. It is thought that when psychosis is induced by drinking, exposure to drugs in individuals born with genetic predispositions increases the risk of psychosis than hazardous alcohol drinking as a risk factor of psychosis. However, as comorbidities of substance use disorder are common in patients with schizophrenia, further studies must evaluate the relationship between alcohol drinking and psychosis.

In this study, the ADHD risk group had a 1.44-times higher relative risk of hazardous alcohol drinking compared to the normal group, suggesting that ADHD is an associated comorbidity and risk factor of hazardous alcohol drinking. In a prospective study on childhood ADHD, the risk of alcohol use disorder in adolescence/adulthood was high in children diagnosed with ADHD, suggesting that ADHD may be a predictor of alcohol use disorder [36]. In another study conducted in Korea, the relationship between ADHD tendency and hazardous alcohol drinking was analyzed in college students. Greater ADHD tendency was associated with higher hazardous alcohol drinking in college students [37]. Impulsive tendencies in ADHD patients are thought to increase hazardous alcohol drinking [11,12], and there may be a common etiological cause, including genetic factors, between ADHD and hazardous alcohol drinking behaviors [36]. Therefore, further studies must evaluate ADHD in college students with hazardous alcohol drinking behaviors.

Finally, our findings showed that a higher score for problem-focused coping was associated with a lower relative risk of hazardous alcohol drinking behaviors. Problem-focused coping is considered an active coping strategy that changes an individual's behavior or environment in a stressful situation rather than being a passive coping strategy that simply manages emotions associated with stress [26,27]. The stress-coping model explains the factors influencing drinking: drinking is a coping response to stress by enhancing positive wishes and reducing negative emotions [38]. In a survey of drinking behavior of college students in Korea, approximately 20% of the participants (one in five) answered that they drink alcohol to relieve stress [4]. Drinking, which is a form of passive coping behavior to relieve emotions associated with stress, may reduce stress in the short term; however, in the long term, drinking may cause problems. In contrast, in a follow-up study, patients who used active coping strategies after treatment for alcohol use disorder had a high possibility of showing no problems related to substance use, including alcohol [39]. Similarly, in our study, our finding suggested that problem-focused coping could be a protective factor for hazardous alcohol drinking compared to passive coping. Problem-focused coping is an adaptive method to actively solve problems by confronting them in stress situations and changing individual behavior or the environment, which may have reduced drinking behavior.

Limitations in this study must be considered in the interpretation of our findings. First, self-reported scales were used in this study, and the subjectivity of the participants may have affected the results. Second, although we assessed the association between hazardous alcohol drinking and psychiatric comorbidities in this study, it was cross-sectional and the exact causal relationship between hazardous alcohol drinking and the described comorbidities could not be evaluated. Follow-up studies are needed to further assess the relationship between mental illnesses and drinking.

CONCLUSION

This study confirmed that hazardous alcohol drinking in college students was related to psychiatric comorbidities like substance use disorder such as smoking, mood disorders such as bipolar disorder and depressive disorder, and ADHD. Additionally, problem-focused stress

coping was a factor that could protect college students from hazardous alcohol drinking. Therefore, our findings suggest that drinking must be adequately evaluated and managed in college students to prevent hazardous alcohol drinking and related psychiatric comorbidities.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

ORCID

Bowon Choi

<https://orcid.org/0000-0002-5991-3897>

Bo-Hyun Yoon

<https://orcid.org/0000-0002-3882-7930>

Suhee Park

<https://orcid.org/0000-0002-7366-8226>

Kyungmin Kim

<https://orcid.org/0000-0001-5376-1418>

Hangoeunbi Kang

<https://orcid.org/0000-0002-7106-2757>

Young-Hwa Sea

<https://orcid.org/0000-0002-0420-2609>

Jye-Heon Song

<https://orcid.org/0000-0001-7370-519X>

Jungeun Bae

<https://orcid.org/0000-0003-1032-129X>

Yuran Jeong

<https://orcid.org/0000-0002-0087-0992>

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