Alcohol Drinking in Adolescents Due to the COVID-19 Pandemic

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ABSTRACT

Background: The COVID-19 pandemic caused changes in individuals' daily lives, including drinking habits. This study attempted to identify factors of Korean adolescents' current alcohol drinking due to the COVID-19 pandemic.

Methods: The study used secondary data from the 17th Korean Youth Risk Behavior Web-based Survey that included 54 848 individuals. In this study, current alcohol drinking was defined as consuming at least 1 alcoholic drink per day for the past month. Changes in physical activity, mealtimes, smoking, and depressive symptoms were recorded.

Results: The multiple logistic regression results show that the risk for current alcohol drinking due to the COVID-19 pandemic was 1.14 times higher in increased physical activity (95% CI: 1.04-1.25, $P=.007$); 1.18 times higher in increased skipping breakfast (95% CI: 1.07-1.30, $P=.001$); 1.22 times higher in decrease skipping breakfast (95% CI: 1.10-1.36, $P < .001$); and 15.69 times higher in increase smoking (95% CI: 12.53-19.64, $P < .001$).

Conclusion: It is necessary to improve social support systems and related policies for adolescents who experienced a change in daily habits due to the COVID-19 pandemic. Our results may contribute to preparing strategies and support measures to reduce drinking by developing personalized healthcare in the future.

INTRODUCTION

The alcohol-drinking culture in Korea changed as social distancing was implemented due to the COVID-19 pandemic. According to the results of the alcohol consumption and intake survey by the Ministry of Food and Drug Safety, in November 2020, the average amount of alcohol per serving and frequency of drinking decreased due to the impact of COVID-19. Overall, the prevalence of high-risk alcohol drinking in all ages increased, with drinking places in bars and restaurants, at home, with partners and co-workers or friends and family, at company outings or social meetings, and drinking alone.[1] In some countries, alcohol consumption increased due to unemployment, financial problems, anxiety, isolation, and stress caused by the COVID-19 pandemic,[2,3] which resulted in various problems such as alcohol abuse, drug abuse, and domestic violence.[3]

Adolescence is a period wherein rapid physical and mental changes occur along with the development of secondary sexual characteristics; adolescents often experience confusion as they try to establish and find their identity[4]; alcohol drinking may be a coping mechanism in response to stress brought about by these changes.[5] Compared with adults, small amounts of alcohol in adolescents may already cause adverse effects on the heart, intestines, and liver.[6] Additionally, these habits and disorders may worsen during adulthood.[7] Accordingly, developed countries have made alcohol consumption in adolescents a high-priority health problem, resulting in systematic efforts to prevent and reduce alcohol consumption in this population. The Korean government and related departments have also prepared and implemented various policies to prevent smoking and alcohol drinking and promote healthy lifestyle among adolescents.[8] According to statistics from the 16th Youth Health Behavior Survey in 2020, the current alcohol drinking rate of middle and high school students in Korea (the percentage of people who have drunk more than 1 glass of alcohol in the past 30 days) was 10.7%, with 12.1% for male and 9.1% for female students. The average age at which alcohol was first consumed was 13.4 years (first or second year in middle school), and the current drinking rate (the percentage of current drinkers with an average drinking rate of more than once in the last 30 days) was 49.0%, with 46.2% for male students and 52.9% for female students.[9] These suggest that among adolescents who

drink, risky drinkers are at the level of 1 in 2 for both male and female students, indicating the seriousness of adolescent alcohol drinking. According to the World Health Organization, consuming excessive amounts of alcohol weakens the body's immune system, reducing its ability to cope with infectious diseases such as COVID-19.[10] In Korea, it is necessary to adopt a strategy to monitor and respond to changes in drinking behavior, alcohol consumption, and harmful factors post-COVID-19 pandemic.[9]

Previous studies dealt with personal characteristics such as gender, family environment, academic performance, and social characteristics related to social media, family, and friends[11-13]; unlike previous research abroad, studies in Korea have not analyzed alcohol-drinking behavior of young adults and its factors based on the situation during the COVID-19 pandemic. Most of the studies analyzed the factors and effects of drinking in some groups, such as women, office workers, and single-person households. Changes in the social economy and daily life due to the COVID-19 pandemic may affect health and drinking habits.

Therefore, this study aimed to analyze the changes in current alcohol drinking due to the COVID-19 pandemic based on the data of an online youth health behavior survey. The results of this study may be used as reference for health projects aimed at improving alcohol drinking habits in young adults. The specific aims are as follows: first, to compare the presence or absence of current alcohol drinking according to the covariate characteristics and changes in daily life following the COVID-19 pandemic; second, to analyze the effects of the participants' covariate characteristics and changes in daily life due to the COVID-19 pandemic on current alcohol drinking.

MATERIAL AND METHODS

Participants and Procedure

The subjects of this study used statistical data from the 17th Korean Youth Risk Behavior Web-based Survey (KYRBS) in 2021 as a target group for middle- and high-school students nationwide as of April 2020. To minimize standard errors in the population stratification stage, 39 regional groups and school levels were divided into 117 layers, after classifying

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MAIN POINTS

- The COVID-19 outbreak has become one of the biggest public health crises of our time, and the daily life restrictions caused by COVID-19 are changing the daily activities associated with anxiety, families, time, and finances.
- In some countries, alcohol consumption has increased due to employment and financial problems, psychological anxiety, isolation, and stress caused by COVID-19.
- This study aims to identify the degree of daily life changes related to COVID-19 among adolescents and to analyze the influence of factors on current alcohol drinking.

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into 17 regional groups, 39 were classified in consideration of geographical accessibility, the number of schools and population, living environment, smoking rate, and drinking rate. In the sample distribution stage, the sample size was allocated to 400 middle schools and 400 high schools. Five middle and high schools were first allocated to 17 cities and provinces, and the number of sample schools was selected using the proportional distribution method to match the sample composition ratio. For sampling, the first extraction unit was selected by permanent random number extraction using stratified colony extraction, and the second extraction unit was surveyed for all selected classes using random extraction for each grade, and students with long-term absences, children with special needs, and students suffering from dyslexia were excluded from the sample. The survey method was conducted in the school's computer room for 45-50 minutes; 113 questions were conducted as anonymous self-written online surveys. With a total of 796 schools and 54 848 students participating, the participation rate in the survey based on the number of students was 92.9%. However, the KYRBS is not representative of all youths, since the respondents are limited to students attending school.

The Korea Centers approved the KYRBS for Disease Control and Prevention (KCDC) and the Institutional Review Board (IRB approval) (2020-06EXP-02-P-A) in 2020. In 2021, the ethics approval for the KYRBS was waived by the KCDC Institutional Review Board under the Bioethics & Safety Act and opened to the public for academic use. All participants provided informed consent to participate in the KYRBS. Anonymity was guaranteed, as those who provided their data were classified by number alone.

Measures

Current Alcohol Drinking: Current alcohol drinking status was defined as "yes" if the individual consumed at least 1 alcoholic drink once a day in the past month.

Covariate Characteristics: Covariate characteristics were analyzed by dividing them into demographic and health-related characteristics. Demographic characteristics included gender, age, grade level, academic performance, household economic level, and changes in economic status after COVID-19. Gender was divided into male and female, and age was based on the year and month of birth. To determine differences according to the grade level, adolescents were classified into middle and high schoolers, and the scores were measured on the 5-point Likert scale as upper (5), mid-upper (4), middle (3), mid-low (2), and low (1). Economic changes after COVID-19 were classified as difficult (very difficult, difficult) and not difficult (not difficult, not difficult at all) according to the individual's answer to "do you think COVID-19 has made the economic state of student families more difficult than before?" Health-related characteristics included subjective health

status, stress, insufficient sleep, and suicidal thoughts; these were graded as very bad (1), bad (2), normal (3), good (4), and very good (5), and the higher the score, the better the health status. The stress score was divided into "I feel very much (4)," "I feel a lot (3)," "I feel a little (2)," and "I hardly feel (1);" the higher the score, the greater the stress. The loneliness score was measured on a scale of "I didn't feel lonely at all (1)," "I hardly felt lonely (2)," "I felt lonely sometimes (3)," "I felt lonely often (4)," and "I always felt lonely (5);" the higher the score, the lonelier the individual. Sleep satisfaction was measured on a 5-point Likert scale as "very sufficient (1)," "sufficient (2)," "mediocre (3)," "not enough (4)," and "not enough at all (5)" and were reclassified as "sufficient (3 points or less)" and "insufficient (3 points or more)." Sadness, hopelessness, and suicidal ideations were divided into "yes" and "no" using the original response scale by asking the questions "have you ever felt sad or hopeless enough to stop your daily life for the last 12 months?" and "have you seriously considered suicide in the last 12 months?."

Changes in Daily Life Related to COVID-19: In this study, changes in daily life due to the COVID-19 pandemic included physical activity, skipping meals, smoking, and development of depressive symptoms. The answers were determined based on the question "What's the change compared to before the COVID-19 pandemic?" It was surveyed as "greatly increased, increased, unchanged, decreased, and greatly decreased" and reclassified as "increased, same, or decreased."

Data Analysis

Considering that the online survey data on the KYRBS is a complex sample design, the data analysis was conducted with descriptive statistics, t-test, chi-square statistics, and multiple logistic regression analysis by applying individual weights to estimate the population by using the Statistical Package for Social Sciences v21.0 statistical program. Descriptive statistics were presented as mean and standard deviation. By using the t-test and chi-square test, this study analyzed the presence or absence of current alcohol drinking according to the covariate characteristics and changes in daily life related to the COVID-19 pandemic. The effect size was calculated using Cohen's d JAMOVI and Cramér's V. Multiple logistic regression was performed on significant variables to present the intersection ratio (odds ratio (OR) and 95% CI. Significance was determined at $P = .05$.

RESULTS

Covariate Characteristics and Changes in Daily Life Related to COVID-19

There were 54 848 subjects in the study. The average age of the subjects was 15.89 years. Regarding grade level, 30 015 (51.0%) were in middle school, and 26 447 (48.3%) were in high school. The average academic performance score was 3.38 out of 5 points, and the average family economic status score was 3.38 out of 5 points. Meanwhile, 16 712 (29.9%) subjects experienced household economic changes due to the COVID-19 pandemic. Regarding health-related characteristics, the average subjective health, stress, and loneliness scores were 3.77, 3.18, and 2.50 out of 5 points, respectively. Also, 30 750 (55.5%) subjects had sufficient sleep, 14 692 (26.8%) had experienced sadness and hopelessness, and 6956 (12.7%) had suicidal ideations. The daily changes related to the COVID-19 pandemic in the number of subjects were the following: (1) physical activity: decreased, 26 001 (49.4%); similar, 17 740 (31.8%); and increased, 7094 (18.8%); (2) skipping breakfast: decreased, 7132 (13.0%); similar, 39 791 (73.2%); increased, 7912 (13.8%); smoking: decreased, 8330 (15.0%); similar, 45 078 (84.0%); increased, 527 (1.0%); (4) depression: decreased, 5543 (9.7%); similar, 29 562 (54.0%); increased, 19 730 (36.3%); and (5) current alcohol drinking, 5803 (10.7%) for (Table 1).

Comparison of Current Alcohol Drinking According to Covariate Characteristics and Changes in Daily Life Related to the COVID-19 Pandemic

Table 2 shows the presence or absence of current alcohol drinking according to the covariate characteristics and changes in daily life related to the COVID-19 pandemic. The average age of current drinkers was 16 years, which was significantly higher ($P < .001$). The prevalence of current alcohol drinking was significantly statistically higher for male students ($P < .001$); high schoolers ($P = .001$); those experiencing economic changes due to the COVID-19 pandemic ($P < .001$); insufficient sleep ($P < .001$); sadness and hopelessness ($P < .001$); and suicidal ideations ($P < .001$). Daily changes related to the COVID-19 pandemic include increased physical activity ($P < .001$); increased or decreased frequency of skipping breakfast ($P < .001$); increased or decreased frequency of smoking ($P < .001$); and increased frequency of depressive symptoms ($P < .001$); similarly, the prevalence of current alcohol drinking in adolescents with these changes was significant (Table 2).

Analysis of Factors Influencing Current Alcohol Drinking

As a result of analyzing the factors influencing current drinking by performing complex sample multiple logistic regression, the explanatory power and fit of the model were found to be significant as Nagelkerke $R^2 = 0.15$, and Wald $F = 136.70$ ($P < .001$), respectively. The risk of current alcohol drinking increased by 1.30 times with age (95% CI: 1.27-1.35), 1.47 times for males (95% CI: 1.36-1.60), 1.44 times for those in high school (95% CI: 1.25-1.65), 1.25 times with household economic changes (95% CI: 1.16-1.34), 1.07 times for those with higher subjective

Table 1. Characteristics of Participants (n=54 848)

Variables	N (%)	Mean ± SD
Covariate characteristic		
Age (years)		15.09 ± 1.74
Gender		
Male	28 401 (51.7)	
Female	26 447 (48.3)	
Type of school		
Middle	30 015 (51.0)	
High school	24 833 (49.0)	
School record score		2.06 ± 0.83
Household economic score		3.27 ± 0.96
Household economic change COVID-19		
Yes	16 712 (29.6)	
No	38 136 (70.4)	
Health-related characteristics		
Subjective health status score		3.77 ± 0.91
Stress score		3.27 ± 0.96
Loneliness score		2.50 ± 1.07
Sleep satisfactory		
Sufficient	30 750 (55.5)	
Insufficient	24 098 (44.5)	
Sadness and hopelessness		
Yes	24 692 (26.8)	
No	40 156 (73.2)	
Suicide ideation		
Yes	6956 (12.7)	
No	47 892 (87.3)	
COVID-19-related daily changes		
Physical activity		
Increase	11 094 (18.8)	
Same	17 740 (31.8)	
Decrease	26 001 (49.4)	
Breakfast skipping		
Increase	7912 (13.8)	
Same	39 791 (73.2)	
Decrease	7132 (13.0)	
Smoking		
Increase	527 (1.0)	
Same	45 078 (84.0)	
Decrease	8330 (15.0)	
Depressive symptoms		
Increase	19 730 (36.3)	
Same	29 562 (54.0)	
Decrease	5543 (9.7)	
Current drinking		
Yes	5803 (10.7)	
No	49 045 (89.3)	

SD, standard deviation.

Table 2. Comparison of Current Alcohol Drinking by Characteristics of Participants (n=54 848)

Variables	Current Alcohol Drinking n (%) or Mean ± SD		P	Effect Size
	Yes	No		
Covariate characteristic				
Age (years)	16.00 ± 1.60	14.99 ± 1.73	<.001	0.562
Gender				
Male	3415 (59.8)	24 986 (50.7)	<.001	0.049
Female	2288 (40.2)	24 059 (49.3)		
Type of school				
Middle	1778 (26.7)	28 237 (53.9)	<.001	0.166
High school	4025 (73.3)	20 808 (46.1)		
School record score	1.86 ± 0.84	2.08 ± 0.83	<.001	0.271
Household economic score	3.25 ± 0.94	3.38 ± 0.86	<.001	0.156
Household economic change COVID-19				
Yes	2177 (37.6)	14 535 (29.0)	<.001	0.053
No	3626 (62.4)	34 510 (71.0)		
Health-related characteristics				
Subjective health status score	3.74 ± 0.97	3.78 ± 0.90	.006	0.045
Stress score	3.45 ± 1.02	3.25 ± 0.95	<.001	0.210
Loneliness score	2.82 ± 1.12	2.46 ± 1.05	<.001	0.347
Sleep satisfaction				
Sufficient	3165 (54.5)	20 933 (43.5)	<.001	0.085
Insufficient	2638 (45.5)	38 112 (56.5)		
Sadness and hopelessness				
Yes	2368 (40.8)	12 324 (25.1)	<.001	0.109
No	3435 (59.2)	36 721 (74.9)		
Suicide ideation				
Yes	1216 (20.8)	5740 (11.7)	<.001	0.086
No	4587 (79.2)	4339 (88.3)		
COVID-19-related daily changes				
Physical activity				
Increase	1464 (24.5)	9630 (18.8)	<.001	0.048
Same	1911 (32.6)	15 829 (31.4)		
Decrease	2426 (42.9)	23 575 (49.9)		
Breakfast skipping				
Increase	1021 (17.5)	7912 (14.0)	<.001	0.040
Same	3914 (67.2)	39 791 (73.2)		
Decrease	866 (15.3)	7132 (12.8)		
Smoking				
Increase	383 (7.5)	144 (0.3)	<.001	0.209
Same	4109 (76.9)	40 969 (84.7)		
Decrease	859 (15.5)	7471 (15.0)		
Depressive symptoms				
Increase	2460 (43.1)	17 270 (36.2)	<.001	0.047
Same	2777 (47.5)	26 785 (54.2)		
Decrease	564 (9.4)	49 034 (9.7)		

SD, standard deviation.

Table 3. Logistic Regression of Factors Influencing Current Alcohol Drinking

Variables	OR (95% CI)	P
Covariate characteristic		
Age (years)	1.30 (1.27-1.35)	<.001
Gender		
Male	1.00	
Female	1.47 (1.36-1.60)	<.001
Type of school		
Middle	1.44 (1.25-1.65)	<.001
High school	1.00	
School record score	0.85 (0.82-0.89)	<.001
Household economic score	1.01 (0.97-1.06)	.559
Household economic change COVID-19		
Yes	1.25 (1.16-1.34)	<.001
No	1.00	
Health-related characteristics		
Subjective health status score	1.07 (1.04-1.11)	<.001
Stress score	0.95 (0.91-0.99)	.012
Loneliness score	1.24 (1.16-1.34)	<.001
Sleep satisfaction		
Sufficient	1.00	
Insufficient	1.24 (1.16-1.34)	<.001
Sadness and hopelessness		
Yes	1.47 (1.36-1.59)	<.001
No	1.00	
Suicide ideation		
Yes	1.42 (1.29-1.57)	<.001
No	1.00	
COVID-19-related daily changes		
Physical activity		
Increase	1.14 (1.04-1.25)	.007
Same	1.00	
Decrease	0.80 (0.74-0.86)	<.001
Breakfast skipping		
Increase	1.18 (1.07-1.30)	.001
Same	1.00	
Decrease	1.22 (1.10-1.36)	<.001
Smoking		
Increase	15.69 (12.53-19.64)	<.001
Same	1.00	
Decrease	1.07 (0.95-1.21)	.245
Depressive symptoms		
Increase	0.89 (0.74-0.86)	.002
Same	1.00	
Decrease	0.98 (0.85-1.11)	.707
Explanatory power and fit of the model		
Wald F	136.70 (P < .001)	
Cox and Snell's R^2	.07	
Nagelkerke R^2	.15	

OR, odds ratio.

health scores (95% CI: 1.04-1.11), 1.24 times with higher loneliness scores (95% CI: 1.16-1.34), 1.24 times with those with sufficient sleep (95% CI: 1.16-1.34), 1.47 times for those who experienced sadness and hopelessness (95% CI: 1.36-1.59), and 1.42 times for those with suicidal ideations (95% CI: 1.29-1.57), which were all significant. Regarding daily life changes, physical activity increased by 1.14 times (95% CI: 1.04-1.25), the frequency of skipping breakfast increased by 1.18 times (95% CI: 1.07-1.30) and decreased by 1.22 times (95% CI: 1.10-1.36), and smoking frequency increased by 15.69 times (95% CI: 12.53-19.64), which were all significant. The risk of current drinking decreased by 0.85 times for those with higher academic grades (95% CI: 0.82-0.89), 0.95 times for those with higher stress scores (95% CI: 0.91-0.99), 0.80 times for those with a decrease in physical activity (95% CI: 0.74-0.86), and 0.89 times for those with a decrease in depressive symptoms (95% CI: 0.82-0.96) (Table 3).

DISCUSSION

This study attempted to identify changes in daily life related to COVID-19 and the degree of current alcohol drinking in Korean adolescents and to identify the factors affecting the characteristics of subjects and changes in daily life on their current alcohol drinking. Since the health behaviors of adolescents affect their habits and health during their lifetime, the identification of their health behaviors and related factors is essential in preparing national health policy measures to prevent chronic diseases in adulthood and reduce social and economic burdens.

In this study, as the age of the subjects increased, the risk of current alcohol drinking was higher; in previous studies on the factors affecting health risk behavior in adolescence, it was reported that older individuals had higher health risk behaviors.[14] Additionally, in the case of high schoolers, the risk of alcohol drinking suggests that the incidence of drinking may increase in higher grade levels; however, it is difficult to implement alcohol prevention education. Hence, the government should implement countermeasures against alcohol drinking in adolescents.

Regarding higher subjective health status, loneliness scores, and in those who experienced sadness, hopelessness, and suicidal ideations, the risk of current alcohol drinking was high, which is consistent with the results of previous studies.[15] Regarding sleep, the risk of current alcohol drinking was high in those with insufficient sleep; several previous studies reported that lack of sleep and health risk behaviors were related, similar to the results of this study.[16-19] In another study, there was a relationship between sleeping time, smoking, and alcohol drinking rate,[16] and another study also reported that sleeping time was related to smoking, alcohol drinking, and drug use.[17] Additionally, lack of sleep reduces activity in the prefrontal cortex, which affects decision-making,

problem-solving, and emotional management.[18] Chronic sleep deprivation results in difficulty waking up, which affects the autonomic nervous system due to poor signal transmission that weakens the ability to control emotions and manage daily tasks; individuals with sleep deprivation reportedly use substances such as cigarettes, alcohol, and marijuana.[19] Since the stress score showed different results from those of previous studies, it is necessary to confirm our results through subsequent studies. These results suggest that alcohol drinking is highly related to mental health factors such as depression, happiness, suicidal ideations, and sleep.

Changes in the family economy, physical activity, mealtimes, smoking, and depression caused by the COVID-19 pandemic affected current alcohol drinking; the risk of current alcohol drinking was highest when the frequency of smoking increased. Alcohol drinking and smoking are representative of substance addiction, and alcohol drinking and smoking were reported to be positively correlated with each other.[20] Smokers are more likely to drink excessively, and smoking can independently affect alcohol abuse. When alcohol drinking and smoking occur at the same time, there is a risk of both tobacco and alcohol-related diseases.[21] In previous studies, smoking in adolescence is often the motivation for drug abuse such as alcohol, marijuana, and drugs. Hence, smoking especially in young adults should be discouraged at a national level.[22] Regarding physical activity and skipping breakfast, increased and decreased frequencies affect the risk of current alcohol drinking; thus, further research and discussion on the causal relationship between these factors are necessary. Regarding depressive symptoms, the results were contrary to the mental health status of the subject; hence, a follow-up study is suggested. A previous study of Korean adults reported that changes in daily life due to the COVID-19 pandemic affected depression.[23] This suggests that policymakers and other stakeholders should consider the changes in daily life related to the COVID-19 pandemic.

The limitations of this study are as follows. As a cross-sectional study using data from the KYRBS, it is difficult to determine a causal relationship. Additionally, since the KYRBS is an anonymous self-reporting online survey, the validity and reliability of the data are limited. Furthermore, since it is a self-assessment, the subject may choose favorable answers. Thus, there is a possibility that it may be reduced or expanded differently from the actual information. Moreover, stress, loneliness, and sleep satisfaction were self-reported, which may cause measurement errors in some variables. In future studies, researchers should use valid and reliable scales for health-related characteristics. Understanding changes occurring in people's alcohol-drinking behavior during the COVID-19 pandemic is an important part of evaluating public health

projects.[24] Thus, additional research on alcohol drinking in young adults is necessary. Based on the results of this study, alcohol-drinking prevention programs for adolescents who experienced changes in their family's economic status, health behavior, and depression due to the COVID-19 pandemic should be implemented.

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