

The Relationship Between the Severity of Drinking and Suicidal Ideation in The General Korean Population—Analysis by Gender and Age Groups

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ABSTRACT

Objective : The suicide mortality rate among Koreans was ranked first among the OECD countries in 2018. Alcohol consumption is a significant risk factor for suicidal behavior. This study examined the relationship between the severity of subjects' drinking habits and the suicidal ideation among Koreans according to gender and age.

Methods : The data of 113,602 people who visited the Kangbuk Samsung Hospital Health Screening Center from January 2013 to December 2014 were used. The severity of subjects' harmful drinking habits was assessed using the Korean version of the Alcohol Use Disorders Identification Test (AUDIT-K). The relationship between the severity of harmful drinking and suicidal ideation was compared using logistic regression analyses. We also examined the tendency through p for trend to identify a trend.

Results : Of the 113,602 study subjects, 6,586 (5.8%) responded that they had thought of committing suicide. After controlling for gender, marriage, education, body mass index (BMI), depression and anxiety, the results showed that the higher the level of harmful drinking, the higher the suicidal ideation.

Conclusion : This study found that, even after controlling depression and anxiety, the severity of drinking could be a significant risk factor for suicidal ideation. (Anxiety and Mood 2020;16(2):91-97)

KEY WORDS : Severity of drinking · AUDIT-K · Suicidal ideation.

Introduction

The World Health Organization's (WHO) global statistics show that more than 800,000 people die from suicide each year.¹ In particular, South Korea's suicide mortality rate was 26.6 per 100,000 members of the population in 2018, ranking it first among 36 member countries of the Organization for Economic Cooperation and Development (OECD). For international comparisons, the age-standardized suicide rate in Korea, calculated by removing the age structure differences from the OECD standard population, was 24.7, more than double the OECD average of 11.5.²

Suicidal behavior is influenced by a variety of factors including physical, mental and environmental factors, but not

one factor specifically.³ Among these factors, our study focused on "drinking" behavior. In the previous study, researchers analyzed the effects of problem drinking on suicidal ideation in a population of 2,876 economically active Korean citizens, using raw data from the The Korea National Health and Nutrition Examination Survey (KNHANES). Compared with the appropriate drinking group, the risk of suicidal ideation was about 2.6 times higher in alcohol use disorder group ($p < 0.001$).⁴ According to the meta-analysis of 17 countries conducted in previous foreign study, there was a significant correlation between problematic drinking and suicidal ideation.⁵ Therefore, we analyzed whether drinking is an independent factor on suicidal ideation after controlling for other factors with an increased sample size.

Also, reports from multiple countries located on different continents also indicate that men consume more alcohol than women, drink more frequently, and are more likely to be hazardous drinkers.⁶⁻⁸ Especially in Korea, the prevalence of high risk drinking is about 5 times higher among men (37%) than women (8%).⁹ On the other hand, domestic studies also

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reported that men with severe drinking problems have increased their suicidal ideations by 1.68 times, while women reported that suicidal ideations increased by 2.65 times.¹⁰ In addition, there are many studies on the relationship between drinking and suicidal ideation among adolescents or the elderly,^{11,12} but studies analyzed by age group are insufficient. So we analyzed whether the severity of problematic drinking could be an independent factor in terms of gender and age group. If the severity of harmful drinking is independent factor for suicidal ideation in each group, it will provide key for lowering suicide attempt. The ultimate goal of this study is to make it possible to lower the likelihood of suicide.

Subjects and Methods

Participants

113,602 participants are Korean men and women aged 18 to 70 who visited the Kangbuk Samsung Hospital Health Screening Center for two years from January 2013 to December 2014. This participants were agreed to provide information. And study was approved by the Institutional Review Board of the Kangbuk Samsung Hospital. The study was conducted using only anonymous information provided by the participants.

Scales

Severity of the drinking problem

To determine the severity of alcohol use, we used the Alcohol Use Disorders Identification Test-Korea (AUDIT-K) to arrive at a total score for the past year's drinking experience. The AUDIT-K is a self-report questionnaire designed to reduce the risks of problematic drinking by pre-screening hazardous drinkers as defined by the WHO and categorize them according to diseases that may be caused by excessive drinking. This is a screening test for proper application. If the total AUDIT-K score was 9 or less in men and 5 or less in women, subjects were classified as an appropriate drinking group. If the score was 10 or more and 19 or less in men and 6 or more and 9 or less in women, subjects were classified as hazardous drinking group. If the score was 20 or above in men and 10 or above in women, subjects were classified as an alcohol use disorder.¹³

Suicidal ideation

We used questions from the KNHANES about suicidal

ideations. Participants chose "Yes" or "NO" to the question "Have you ever thought about suicide in the last year?"

Depression and anxiety

Depressive symptoms were defined according to the Korean Center for Epidemiological Studies Depression Scale (CES-D). CES-D is a self-report questionnaire and one of the most widely used in depression screening tests for assessing the degree of depression experienced by adults. CES-D consists of a total of 20 items. Each item is scored from 0 to 3 points, and the higher the score, the more severe the depressive symptoms.¹⁴ Anxiety symptoms were evaluated using the Beck Anxiety Inventory (BAI). BAI is a self-report questionnaire developed by Beck to assess individual anxiety. The BAI consists of a total of 21 items.¹⁵

Statistical analysis

The collected data were analyzed using the 2009 SPSS PASW Statistics for Windows, Version 18.0 Chicago. We divided participants into groups with and without suicidal ideation, and compared their demographic data. Categorical variables (age, gender, marital status, education, BMI) were expressed as n (%), and the ratio difference test between groups was tested using the chi-square test. Continuous variables (BAI, CES-D) was tested by mean \pm sd. The mean difference test between the groups was tested by the t-test.

The effects of harmful drinking on suicidal ideation were analyzed using logistic regression by controlling variables that showed significant differences through the chi-square test and t-test on the above demographic data. Firstly, a regression analysis was performed by controlling for gender, marriage, education, and BMI (Model 1), then a second regression analysis was performed by controlling for BAI and CES-D (Model 2) in addition to the above variables. Compared to the group without suicidal ideation, odds ratio (OR) and 95% confidence interval (95% CI) were obtained in the group with suicidal ideation.

When conducting studies that assess the association between risk factors and outcomes that have more than one category, it is possible to evaluate the association between outcomes by comparing each category and outcome of the risk level with a reference level.¹⁶ This analysis called p for trend, which is a unique piece of information which can be used to determine if there is a dose-response effect.¹⁷ In this study, we used p for trend for analyzing whether there was a positive correlation between the severity of the alcoholism and the sui-

cidal ideation.

Results

Participant's demographic characteristics

Of the 113,602 study subjects, 6,586 (5.8%) responded that they had thought of committing suicide over the past two years. There were significant differences in the number of suicidal ideations between the age groups ($p < 0.001$). And there was significant difference in the number of suicidal ideations between the gender ($p < 0.001$). Based on their marital status, there was significant difference in the number of suicidal ideations between the marital status ($p < 0.001$). In the evaluation of psychiatric symptoms, the BAI was significantly higher in the group with suicidal ideation (12.23 ± 9.15) and the CES-D was also higher in the group with suicidal ideation (16.05 ± 10.83) (Table 1).

The relationship between problematic drinking and suicidal ideation by gender

Regardless of gender, the higher the problematic drinking rate, the more significant suicidal ideation was in Model 2. Odds ratio for hazardous drinking group was 1.15 (95% CI : 1.08–1.22) and odds ratio for alcohol use disorder group was 1.40 (95% CI : 1.27–1.54).

Suicidal ideation of men was significantly higher in both Model 1 and 2. In women, the higher the severity of problematic drinking, the higher the suicidal ideation in Model 1 and in the case of Model 2, the hazardous drinking group was not significantly related to the appropriate drinking group, but according to the p for trend, the more severe the drinking problem, the more likely it was to be associated with suicidal ideation (p for trend = 0.001) (Table 2).

The relationship between problematic drinking and suicidal ideation by age in each gender

At first, men was analyzed according to age group. In most age groups, even when age, marital status, education, BMI,

Table 1. Clinical characteristics of participants with or without suicidal ideation

	Total (n=113,602, 100%)	With suicidal ideation (SI) (n=6,586, 5.8%)	Without SI (n=107,016, 94.2%)	p
Age	39.97 ± 6.99	39.08 ± 7.06	40.02 ± 6.98	<0.001
18–29	4429 (3.9)	385 (0.06)	4044 (0.04)	<0.001
30–39	50728 (44.65)	3231 (0.49)	47497 (0.44)	
40–49	47066 (41.43)	2406 (0.37)	44660 (0.42)	
50–69	11379 (10.02)	564 (0.09)	10815 (0.1)	
BAI	5.05 ± 5.96	12.23 ± 9.15	4.61 ± 5.41	<0.001
CES-D	6.24 ± 6.85	16.05 ± 10.83	5.64 ± 6.03	<0.001
AUDIT-K (mean)	6.70 ± 4.51	7.12 ± 6.76	6.67 ± 5.65	<0.001
Gender				<0.001
Women	29342 (25.83)	2858 (43.4)	26,484 (24.7)	
Men	84260 (74.17)	3728 (56.6)	80532 (75.3)	
Marital status				<0.001
Married	96142 (85.11)	5146 (78.5)	90996 (85.5)	
Etc	16815 (14.89)	1406 (21.5)	15409 (14.5)	
Education				<0.001
≤ Middle school	396 (0.35)	44 (0.7)	352 (0.3)	
High school	13750 (12.17)	1241 (19)	12509 (11.7)	
≥ College	98871 (87.48)	5259 (80.4)	93612 (87.9)	
BMI				<0.001
Underweight (<18.5)	3776 (3.33)	330 (5)	3446 (3.2)	
Normal (1.85–23)	42351 (37.33)	2826 (43)	39525 (37)	
Overweight (23–25)	28944 (25.52)	1452 (22.1)	27492 (25.7)	
Obese (≥25)	38367 (33.82)	1969 (29.9)	36398 (34.1)	

Data expressed as n (%) or mean ± SD. BAI : beck anxiety inventory, CES-D : Center for Epidemiological Studies Depression Scale

Relationship between the Severity of drinking and Suicidal Ideation

BAI and CES-D were controlled, suicidal ideation tended to be higher with the severity of problematic drinking (p for trend of 30–39 age group in Model 2 : <0.001, p for trend of 40–49 age group : <0.001, p for trend of age group 50 or above : 0.016).

However, those between the ages of 18 and 29 years showed no positive correlation between the severity of problematic drinking and suicidal ideation (p for trend : 0.154 for model ages 18–29) (Table 3).

Table 2. Relationship between problematic drinking and suicidal ideations by gender

	Unadjusted OR (95% CI)	M 1 OR (95% CI)	M 2 OR (95% CI)
Total			
Appropriate drinking	1 (reference)	1 (reference)	1 (reference)
Hazardous drinking	1.144 (1.08–1.21)	1.327 (1.25–1.41)	1.147 (1.08–1.22)
Alcohol use disorder	2.901 (2.67–3.14)	2.422 (2.23–2.63)	1.402 (1.27–1.54)
p for trend	<0.001	<0.001	<0.001
Men			
Appropriate drinking	1 (reference)	1 (reference)	1 (reference)
Hazardous drinking	1.398 (1.30–1.50)	1.384 (1.29–1.49)	1.201 (1.11–1.30)
Alcohol use disorder	3.324 (2.96–3.73)	3.297 (2.29–3.71)	1.716 (1.50–1.97)
p for trend	<0.001	<0.001	<0.001
Women			
Appropriate drinking	1 (reference)	1 (reference)	1 (reference)
Hazardous drinking	1.369 (1.23–1.52)	1.308 (1.17–1.46)	1.109 (0.98–1.25)
Alcohol use disorder	2.126 (1.90–2.38)	1.947 (1.73–2.19)	1.245 (1.09–1.42)
p for trend	<0.001	<0.001	0.001

Values are presented as odds ratio (95% confidence interval). M1 (model 1) is adjusted for gender, marriage, education, BMI. M2 (model 2) is adjusted for gender, marriage, education, BMI, BAI, CES-D. OR : odds ratio

Table 3. Relationship between problematic drinking and suicidal ideation by age group in men

	Unadjusted OR (95% CI)	M 1 OR (95% CI)	M 2 OR (95% CI)
18–29 years old			
Appropriate drinking	1 (reference)	1 (reference)	1 (reference)
Hazardous drinking	1.223 (0.83–1.79)	1.187 (0.81–1.75)	1.109 (0.73–1.68)
Alcohol use disorder	3.659 (1.88–7.10)	3.560 (1.82–6.97)	2.178 (0.97–4.92)
p for trend	0.004	0.007	0.154
30–39 years old			
Appropriate drinking	1 (reference)	1 (reference)	1 (reference)
Hazardous drinking	1.453 (1.31–1.61)	1.391 (1.26–1.54)	1.197 (1.07–1.34)
Alcohol use disorder	3.167 (2.61–3.85)	2.888 (2.37–3.52)	1.450 (1.15–1.83)
p for trend	<0.001	<0.001	<0.001
40–49 years old			
Appropriate drinking	1 (reference)	1 (reference)	1 (reference)
Hazardous drinking	1.419 (1.27–1.59)	1.409 (1.26–1.58)	1.238 (1.10–1.40)
Alcohol use disorder	3.526 (2.95–4.21)	3.473 (2.91–4.15)	1.942 (1.58–2.38)
p for trend	<0.001	<0.001	<0.001
50 or above			
Appropriate drinking	1 (reference)	1 (reference)	1 (reference)
Hazardous drinking	1.381 (1.11–1.72)	1.344 (1.08–1.68)	1.119 (0.88–1.42)
Alcohol use disorder	4.021 (3.00–5.40)	3.775 (2.80–5.10)	1.630 (1.14–2.33)
p for trend	<0.001	<0.001	0.016

Values are presented as odds ratio (95% confidence interval). M1 (Model 1) is adjusted for gender, marriage, education, BMI. M2 (Model 2) is adjusted for gender, marriage, education, BMI, BAI, CES-D. OR : odds ratio

We also analyzed age groups in women. When the age, marital status, education and the BMI were controlled, suicidal ideation tended to be higher with the severity of problematic drinking. However, when depression and anxiety were controlled for, the above trends were not evident in the age group except among those aged between 30 and 39 years (p for trend of 18–29 years old group : <0.721, p for trend of 30–39 years old group : <0.007, p for trend of 40–49 years old group : 0.056, p for trend of 50 or above years old group : 0.582) (Table 4).

Discussion

A variety of factors have been reported to affect suicide. At first drinking was not considered to be a major variable in suicide research, but since the mid-1980s, it has been reported as a major risk factor for suicide.¹⁸ The link between alcohol abuse and suicidal behavior can be explained by several mechanisms. First, there is evidence from a biological point of view that the common denominator may be serotonergic dysfunction in the complex relationship between alcohol, aggressiveness, impulse and suicide. Studies show that moderate alcohol consumption in social drinkers causes a 20% reduction in ce-

rebral serotonin.¹⁹ The serotonin deficiency hypothesis of alcohol-induced aggressive behavior suggests that a susceptible individual tends to have significantly lower serotonin levels after alcohol consumption and thereby becomes more aggressive.¹⁹ Secondly, the mechanism through which acute alcohol consumption enhances aggression is reduced activity in the prefrontal cortex (PFC).²⁰ Furthermore, in hostile situations, alcohol-induced reduction in PFC activity is thought to weaken the regulation of activity in the ventral striatum and amygdala.²¹

We examined 113,602 people who visited the OO Hospital Health Screening Center for 2 years from January 2013 to December 2014 to check the relationship between the seriousness of problematic drinking and suicidal ideation. The relationship between suicidal ideation and the severity of problematic alcohol consumption was checked by gender and age. As a result of stratification by gender, the higher the degree of problematic drinking in men, the higher the likelihood of a suicidal ideation, and the higher the degree of problematic drinking in women, so too the higher the likelihood of suicidal ideation. When men was stratified by age, the suicidal ideation was significantly higher across all age groups except

Table 4. Relationship between problematic drinking and suicidal ideation by age group in women

	Unadjusted OR (95% CI)	M 1 OR (95% CI)	M 2 OR (95% CI)
18–29 years old			
Appropriate drinking	1 (reference)	1 (reference)	1 (reference)
Hazardous drinking	1.367 (1.00–1.88)	1.331 (0.96–1.84)	1.164 (0.81–1.67)
Alcohol use disorder	1.639 (1.18–2.28)	1.454 (1.04–2.04)	1.036 (0.70–1.52)
p for trend	0.002	0.018	0.721
30–39 years old			
Appropriate drinking	1 (reference)	1 (reference)	1 (reference)
Hazardous drinking	1.380 (1.19–1.60)	1.312 (1.13–1.52)	1.131 (0.96–1.33)
Alcohol use disorder	2.084 (1.78–2.44)	1.922 (1.64–2.26)	1.263 (1.05–1.52)
p for trend	<0.001	<0.001	0.007
40–49 years old			
Appropriate drinking	1 (reference)	1 (reference)	1 (reference)
Hazardous drinking	1.313 (1.08–1.59)	1.305 (1.08–1.58)	1.060 (0.85–1.32)
Alcohol use disorder	2.222 (1.81–2.73)	2.110 (1.71–2.61)	1.292 (1.01–1.66)
p for trend	<0.001	<0.001	0.056
50 or above			
Appropriate drinking	1 (reference)	1 (reference)	1 (reference)
Hazardous drinking	1.224 (0.72–2.09)	1.065 (0.60–1.88)	0.863 (0.42–1.80)
Alcohol use disorder	3.085 (1.90–5.00)	2.695 (1.62–4.48)	1.288 (0.67–2.47)
p for trend	<0.001	0.001	0.582

Values are presented as odds ratio (95 % confidence interval). M1 (Model 1) is adjusted for gender, marriage, education, BMI : M2 (Model 2) is adjusted for gender, marriage, education, BMI, BAI, CES-D. OR : odds ratio

for those aged between 18 and 29 years. When women was stratified by age, the relationship was observed only in 30–39 age group. Those findings are similar to a Haw and Hawton study, wherein problematic alcohol use was one of the most common contributing factors in deliberate self-harm among females of 25 years and older, with the exception of those of 55 years and up.²² According to this study, among female only 35–54 age group reported alcohol contribute to deliberate self-harm. while in men, all age group reported alcohol contribute to deliberate self-harm.

Many previous studies have reported a significant correlation between suicidal ideation, suicide attempts, and alcoholism.^{23,24} First, Inskip disproved the previous theory that the life-time risk of suicide was similar in alcoholic and non-alcoholic populations by using modern computerized curve model techniques.²⁵ The life-time risk of suicide in alcohol-dependent populations is 7%, which is relatively higher than in the general population. This study showed a significant link between alcohol dependence and suicide, but the study only involved 27 alcohol-dependent patients and did not control for other variables.

After reviewing the literature on suicide, Stack found in 89 studies across 17 countries that the higher the alcohol consumption, the higher the suicide rate.²⁶ In Norway, a prospective follow-up link between alcohol abuse and suicide among 40,000 people over 40 years of age showed a relative risk (RR) of 6.9 among the alcohol-abusing members of the population.²⁷ This result indicates a significant correlation between problematic drinking and suicide in foreign studies. However, the above studies also had limitations due to insufficient sample sizes and uncontrolled variables.

In Korea, 2,876 economically active populations were extracted from the 2013 KNHANES, and a study was conducted on the relationship between problematic drinking, depression and suicidal ideation. The risk of suicide was 1.5 times higher in the risky-drinking group than in the healthy-drinking group, and the alcohol use disorder group had 2.6 times the frequency of suicidal ideations than that of the normal drinking group.⁴ However, the above study did not control for depression and anxiety, and there may have been concerns related to the limitations of their small sample size. In this regard, we analyzed whether this association occurs when we increased the sample population and controlled for depression and anxiety, and prove that there was a significant association.

On the other hand, in this study, the relationship between the degree of problematic drinking and suicidal ideation was

divided by gender, and both men and women demonstrated a positive relationship between the degree of problem drinking and suicide. But when we divided by age group, the relevance was weakened especially in women after adjusting for depression and anxiety. It might be because women are more influenced by anxiety and depression with suicidal ideation. In many studies, men suicide attempters had a longer history of alcohol use disorder than women, or had blood alcohol levels detectable by autopsy.^{28,29} However, there are studies with more relevant findings in women, so gender differences may vary from study to study.^{30,31} This may be because each country has a different drinking culture and each age has a different suicide attempt rate.³² Therefore, further empirical evidence needs to be presented in future studies.

Next, after analyzing the association between the degree of problematic drinking and suicide by age group, there was no tendency to show the positive relationship between problematic drinking and suicidal ideation after correcting in the group of 18- to 29-year-olds. A study using a sample of Korean college students found that college students had higher alcohol consumption rates than any other population group, and that alcohol abuse in college students did not particularly predict symptoms of mental ill-health.³³

The strength of this study lies in the fact that it has more study samples than the previous studies. In previous studies, there was a limit to the exploration of risk factors for suicidal ideation due to the small study sample. This study overcomes this problem and the problematic drinking behavior itself is independent of suicidal ideation even when controlling for demographic factors as well as for depression and anxiety.

The limitations of this study are as follows : First, it was not a multi-center study but a study that was conducted at one institution. Single-center trials might have some statistical errors, but this study could overcome through large number of participants. Second, it was difficult to judge the seriousness of the suicidal ideation evaluation method with a simple yes/no evaluation. Third, because of the written self-report method applied, a recall error may have occurred. Fourth, depression and anxiety were controlled, but this reflected only the severity on a scale and may not have been accurate as a psychiatric diagnosis was not made by medical staff based on the diagnostic criteria. Lastly, Since this study is a cross-sectional design study, it cannot explain the causal relationship between the severity of harmful drinking and suicidal ideation. So a longitudinal further study is needed from now on.

Conclusion

When controlling for other factors in the total population, the hazardous drinking group was significantly associated with suicidal ideation compared to the appropriate drinking group, and the alcohol use disorder group was significantly associated compared with the hazardous drinking group. The same result was found in each gender group. And the same trend was also observed in age groups except the group aged 18 to 29 years in men. Meanwhile only 30–39 age group showed same result in women.

Since suicidal ideation tends to precede suicide attempts, preventing problematic drinking, which is a risk factor associated with suicidal ideation, may be an important axis in minimizing suicide risks. Further studies would be needed to explore a better way to prevent problematic drinking.

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