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ORIGINAL RESEARCH

Association between alcohol consumption and severity of self-harm behaviors based on suicidal intent in patients admitted to the emergency department for self-harm

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Abstract

This study aimed to investigate the association between alcohol consumption and the severity of self-harm behaviors based on the suicidal intents of patients admitted to the emergency department (ED) for self-harm. This was a retrospective study on patients admitted to the ED between March 2017 and December 2020 owing to self-harm behaviors and were grouped into a suicide attempt (SA) and non-suicidal self-harm (NSSH) group. A total of 642 (73.5%) and 232 (26.5%) patients were classified into SA and NSSH groups, respectively. In the SA group, 270 (42.1%) patients reported consuming alcohol, which was independently associated with $\geq$12 years of formal education and no history of psychiatric hospitalization. In the NSSH group, 87 (37.5%) patients reported consuming alcohol, which was associated with male sex, being married or unmarried but living together, $\geq$12 years of formal education, and no history of depression. Alcohol consumption could predict ED disposition in the SA group but not in the NSSH group. The impact of alcohol consumption varied according to suicidal intents among patients admitted to the ED for self-harm behavior. Regardless of suicidal intent, patients with a higher education level tended to drink alcohol when engaging in self-harm behaviors.

Keywords

Alcohol drinking; Emergency department; Self-harm behavior

1. Background

Suicide is a major cause of mortality worldwide. South Korea ranked first in suicide rates among countries of the Organization for Economic Co-operation and Development from 2003 to 2017 and second in 2018 [1] and has a suicide rate of 25.6 per 100,000 population [2].

Alcohol use is a key predictor of suicide. Chronic alcohol use disorder and acute alcohol consumption are known risk factors for suicide attempts and mortality [3]. Approximately 37% of suicides and 40% of suicidal attempts are preceded by alcohol drinking [4]. Previous studies reported that drinking could increase the risk of suicide by 5–10 times [5–7]. It was also reported that the amount of alcohol consumed could affect suicide fatality based on the risk of fatal suicide methods such as fire and strangulation, which was found to increase after heavy drinking [5, 8].

Although alcohol use is an established risk factor for suicide, the significance of alcohol use is often neglected in clinical practice because suicide attempters due to alcohol use are usually discharged from the emergency department (ED) without proper psychiatric evaluation or even short inpatient care [9, 10]. This could be attributed to the clinical bias that suicide attempts in a drunk state are probably unplanned and unintended. Several studies have reported that alcohol consumption was not associated with suicide planning and suicide intentionality [11], and those suicide attempters who consumed alcohol had lower suicide planning and intentionality [9].

According to Bagge *et al.* [12], this inconsistency regarding the impact of alcohol use on suicide attempts could be attributed to classifying the alcohol use group into a single category. Bagge *et al.* [12] classified drinking before suicide attempts based on motives and found that suicide planning and intentionality did not differ between suicide attempts facilitated by alcohol drinking and sober suicide attempts. Contrastingly, people who drank alcohol for a reason other than facilitating their suicide attempt showed a lower suicide planning and intentionality.

Self-harm refers to the intentional infliction of harm on oneself, including mutilating body parts or poisoning oneself, regardless of suicidal intents [13]. Based on the suicidal intent, self-harm can be classified as non-suicidal self-harm (NSSH) and suicidal attempt (SA).

Accordingly, this study aimed to investigate the association

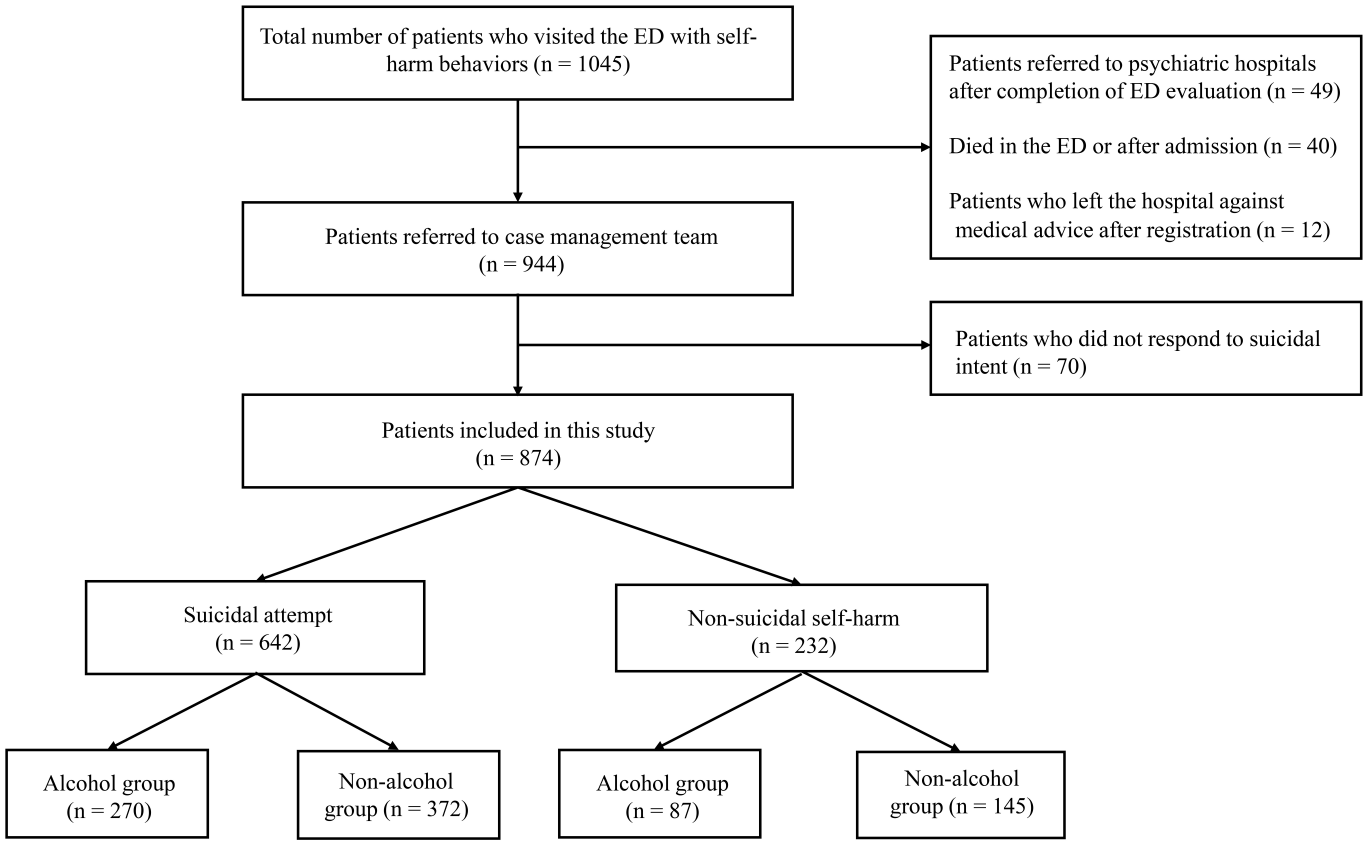

FIGURE 1. Flowgram of the patient enrollment. ED: emergency department.

between alcohol consumption and the severity of self-harm behaviors based on the suicidal intent in patients admitted to the ED for self-harm.

2. Material and methods

2.1 Study design and setting

This retrospective study was based on patients admitted to the ED from March 2017 to December 2020 at a single tertiary hospital with self-harm behavior as main cause. The case management team at the Life Crisis Intervention Center comprises one psychiatrist, one emergency medicine specialist, and two coordinators certified by the Korea Psychology Counselling Association.

2.2 Participants

During the study period, 1045 patients were admitted for self-harm behaviors. Among them, we excluded 12 patients who refused treatment and were thus not admitted (discharge against medical advice), 49 patients who were transferred to a psychiatric hospital or other facilities, and 40 patients who died at the ED or after hospitalization. An additional 70 patients were also excluded due to unspecified suicidal intents. Thus, a lot of 874 patients were eligible for this study and were classified according to their suicidal intent and alcohol use (Fig. 1).

2.3 Variables and measurement

Based on an initial assessment form, the following information were obtained from the patients: sex, age, vital signs (systolic blood pressure, diastolic blood pressure, heart rate, respiratory rate, body temperature), level of consciousness (alert or not alert), type of visit (visit during regular hours (9 AM–5 PM weekdays) or off-hours), time from self-harm behavior to ED admission, marital status (single or married/living together), religion, employment status, income (based on monthly household income of 1.5 million Korean Won (KRW) and 2.5 million KRW), education level, type of health insurance (national health insurance, Medicaid), cohabitation with someone, having asked for help after self-harm behavior, planning of self-harm behavior, method of self-harm (violent/nonviolent method), motive for self-harm (psychiatric motive or others), place of self-harm (familiar/unfamiliar place), alcohol use during or before self-harm behavior (self-report or report by caregiver), history of suicide attempt, history of psychiatric care, use of psychiatric medications, history of psychiatric hospitalization, family psychiatric history, physical illness at admission (chronic disease with/without disability, acute disease or physically healthy), suspected psychiatric diagnosis (depression, other mental disorder, not intervened or could not be diagnosed), and ED disposition (discharged, admitted to ward, admitted to psychiatry, admitted to the intensive care unit (ICU)).

The self-harm methods were classified as violent (*i.e.*, strangulation, drowning, cutting and penetrating, jumping, crashing and burning) or nonviolent (*e.g.*, pesticide or gas poisoning).

The suspected psychiatric diagnosis was determined after consultation with a psychiatrist. Patients who refused psychiatric consultation were considered "not intervened". The primary outcome was ED disposition, which was used as a surrogate marker for determining the severity of self-harm behaviors.

Coordinators of the case management team evaluated the initial assessment forms under the supervision of a psychiatrist. Items omitted in the initial assessment form were supplemented based on information regarding the patients' electronic medical records. A senior emergency medicine resident performed data classification and organization under the supervision of an emergency medicine specialist.

2.4 Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) 18.0 software (SPSS Inc., Chicago, IL, USA).

Between-group comparisons of general characteristics and self-harm-related characteristics were performed using univariate analysis. Categorical and continuous variables were analyzed using the chi-square test/Fisher's exact test and independent *t*-test/Mann-Whitney U test, respectively. To identify predictors of alcohol use, we determined factors that significantly differed between the alcohol and non-alcohol groups in the SA and NSSH groups, followed by analysis using multiple logistic regression through backward elimination. Odds ratios (OR) and 95% confidence intervals (CIs) were computed using logistic regression. The regression model was evaluated using the Hosmer-Lemeshow model fit test. Statistical significance was set at $p < 0.05$.

3. Results

3.1 Comparison of general characteristics of patients admitted to the ED after self-harm behaviors

There were 642 and 232 patients in the SA and NSSH groups. In the SA group, the mean age was 39.7 ± 19.7 years and consisted of 220 (34.3%) males. Of the 642 patients in the SA group, 270 (42.1%) reported consuming alcohol before or during the self-harm behavior. We also observed that 87.0% and 80.4% of patients in the alcohol and non-alcohol groups were admitted during off-hours ($p = 0.03$). Regarding education level, 80.7% and 69.1% of patients in the alcohol and non-alcohol groups had ≥12 years of formal education ($p < 0.01$). Further, 10.5% and 5.4% of patients in the alcohol and non-alcohol groups were engaged in self-harm behavior in an unfamiliar place ($p = 0.03$). In the NSSH group, the mean age of the patients was 33.6 ± 17.4 years and consisted of 50 (21.6%) males and 182 (78.4%) females. Of them, 87 (37.5%) were admitted after drinking alcohol. A higher percentage of male patients was observed in the alcohol group (33.3%) than in the non-alcohol group (14.5%) ($p < 0.01$). Further, the percentage of married or unmarried patients who lived together was higher in the alcohol group (49.3%) than in the non-alcohol group (24.4%) ($p < 0.01$). Regarding education level, the percentage of patients with ≥12 years of formal education was significantly higher in the alcohol group (82.8%) than in the non-alcohol group (61.7%) ($p < 0.01$) (Table 1).

3.2 Comparison of self-harm-related characteristics of patients admitted to the ED after self-harm behaviors

In the SA group, there was a higher percentage of patients with a history of psychiatric care in the alcohol group than in the non-alcohol group (58.5% *vs.* 32.4%; $p = 0.03$). Contrastingly, there was a lower percentage of patients with a history of psychiatric hospitalization in the alcohol group than in the non-alcohol group (12.9% *vs.* 21.5%; $p = 0.01$). We also observed a lower percentage of patients taking psychiatric medications in the alcohol group than in the non-alcohol group (51.0% *vs.* 60.7%; $p < 0.01$). Further, a higher percentage of patients chose a violent self-harm method in the alcohol group than in the non-alcohol group (49.6% *vs.* 34.7%; $p < 0.01$). There were significant between-group differences in the prevalence of depression and other mental disorders as well as the rate of intervened/no diagnoses in both alcohol groups (alcohol group; 39.2%, 2.2% and 58.6% *vs.* non-alcohol group; 49.7%, 7.8%, and 42.2% ($p < 0.01$)). Regarding ED disposition, the alcohol and non-alcohol groups had significantly higher percentages of patients admitted to a general ward/ICU and a psychiatric ward, respectively ($p < 0.01$).

In the NSSH group, the alcohol group had a higher percentage of patients in the non-alert state than the non-alcohol group ($p = 0.02$). The percentage of patients who sought help was higher in the non-alcohol group than in the alcohol group (30.7% *vs.* 22.7%; $p = 0.03$). The non-alcohol group had a significantly higher percentage of patients with a history of psychiatric hospitalization than the non-alcohol group ($p < 0.01$), while the non-alcohol group had a significantly higher percentage of patients with a family history of psychiatric illness than the non-alcohol group (28.8% *vs.* 10.9%; $p < 0.01$). Regarding suspected psychiatric diagnoses, the depression rate was higher in the non-alcohol group than in the alcohol group (46.2% *vs.* 27.6%; $p < 0.01$) (Table 2).

3.3 Multiple logistic regression to identify the factors associated with alcohol use

In the SA group high school or higher education level (≥12 years of formal education) (OR: 2.049, 95% CI: 1.191–3.524: $p = 0.010$) and history of psychiatric hospitalization (OR: 0.507, 95% CI: 0.260–0.985; $p = 0.045$) were associated with alcohol use (Table 3).

Comparatively, in the NSSH group, male sex (OR: 7.711, 95% CI 2.476–24.008; $p < 0.001$), married/living together (OR: 6.236, 95% CI 2.291–16.973; $p < 0.001$), high school graduation or higher (≥12 years of formal education) (OR: 5.079, 95% CI 1.456–17.723; $p = 0.011$), and suspected depression (OR: 0.279, 95% CI: 0.096–0.806; $p = 0.018$) were associated with alcohol use (Table 4).

4. Discussion

This study investigated the impact of alcohol consumption on the severity of self-harm injury based on suicidal intent in patients admitted to the ED for self-harm behaviors. For the

TABLE 1. General characteristics of patients who visited the emergency department after a self-harm.

	Suicide attempt			Non-suicidal self-harm		
	A (n = 270)	NA (n = 372)	*p*-value	A (n = 87)	NA (n = 145)	*p*-value
Age (years)	39.9 ± 17.6	40.3 ± 21.4	0.77	38.1 ± 16.1	30.7 ± 17.7	<0.01
Sex			0.87			<0.01
Male	94 (34.8)	126 (33.9)		29 (33.3)	21 (14.5)	
Female	176 (65.2)	246 (66.1)		58 (66.7)	124 (85.5)	
Visit time			0.03			0.80
During business hours	35 (13.0)	73 (19.6)		18 (20.7)	28 (19.3)	
Beyond business hours	235 (87.0)	299 (80.4)		69 (79.3)	117 (80.7)	
Marital status			0.09			<0.01
Single	104 (49.8)	175 (57.4)		35 (50.7)	93 (75.6)	
Married or partnered	105 (50.2)	130 (42.6)		34 (49.3)	30 (24.4)	
Education status			<0.01			<0.01
<12 years	38 (19.3)	90 (30.9)		11 (17.2)	46 (38.3)	
≥12 years	159 (80.7)	201 (69.1)		53 (82.8)	74 (61.7)	
Religion			0.77			0.60
Yes	41 (24.8)	64 (27.4)		9 (19.1)	11 (15.1)	
No	124 (75.2)	170 (72.6)		38 (80.9)	62 (84.9)	
Employment			0.48			0.06
Yes	96 (43.8)	152 (47.1)		36 (51.4)	84 (65.1)	
No	123 (56.2)	171 (52.9)		34 (48.6)	45 (34.9)	
Cohabitant			0.60			0.18
Yes	136 (58.9)	210 (61.4)		50 (64.1)	97 (72.9)	
No	95 (41.1)	132 (38.6)		28 (35.9)	36 (27.1)	
Health status			0.30			0.59
Healthy	196 (76.9)	254 (71.3)		72 (86.7)	114 (83.2)	
Acute disease	1 (0.4)	6 (1.7)		1 (1.2)	3 (2.2)	
Chronic disease without disability	39 (15.3)	63 (17.7)		8 (9.6)	11 (8.0)	
Chronic disease with disability	19 (7.5)	33 (9.3)		2 (2.4)	9 (6.6)	
Income			0.11			0.17
<1.5 million KRW/mon	68 (37.8)	75 (30.5)		14 (28.0)	18 (21.2)	
1.5–2.5	45 (25.0)	50 (20.3)		13 (26.0)	14 (16.5)	
>2.5	67 (37.2)	121 (49.2)		23 (46.0)	53 (62.4)	
Insurance			<0.01			0.07
National health insurance	209 (81.6)	325 (89.3)		67 (82.7)	129 (90.8)	
Medicaid beneficiary	47 (18.4)	39 (10.7)		14 (17.3)	13 (9.2)	
Time from attempting to ED visit (hours)	27.3 ± 426.3	7.3 ± 21.7	0.34	6.3 ± 32.5	7.6 ± 18.8	0.53
Location of self-harm			0.03			0.11
Familiar	221 (89.5)	331 (94.6)		77 (91.7)	133 (97.1)	
Non-familiar	26 (10.5)	19 (5.4)		7 (8.3)	4 (2.9)	

Data are presented as frequencies (percentages) or means ± standard deviations.
A: alcohol group; NA: non-alcohol group; KRW: Korean Won; ED: emergency department.

TABLE 2. Comparison of suicidal attempt-related characteristics of patients who visited the ED after a self-harm.

	Suicide attempt			Non-suicidal self-harm		
	A (n = 270)	NA (n = 372)	*p*-value	A (n = 87)	NA (n = 145)	*p*-value
Consciousness, n (%)			0.60			0.02
Alert	200 (74.3)	269 (72.5)		63 (74.1)	125 (86.8)	
Altered mentality	69 (25.7)	102 (27.5)		22 (25.9)	19 (13.2)	
Vital signs						
SBP (mmHg)	124.9 ± 24.1	122.8 ± 24.2	0.28	121.1 ± 23.6	120.5 ± 20.0	0.85
DBP (mmHg)	75.9 ± 14.9	73.4 ± 14.1	0.03	72.9 ± 15.1	73.1 ± 13.8	0.95
Pulse rate (beat/min)	97.6 ± 20.6	90.8 ± 20.0	<0.01	93.5 ± 16.6	92.8 ± 18.2	0.78
Respiratory rate (/min)	19.7 ± 2.6	20.0 ± 3.7	0.26	19.2 ± 2.5	20.2 ± 12.6	0.46
Body temperature (°C)	36.8 ± 2.4	36.8 ± 1.9	1.00	36.7 ± 0.6	36.8 ± 0.8	0.42
Ask for help			0.27			0.03
Yes	38 (15.8)	42 (12.4)		18 (22.8)	51 (37.0)	
No	203 (84.2)	297 (87.6)		61 (77.2)	87 (63.0)	
Planed self-harm			0.06			0.06
Yes	20 (7.9)	45 (12.9)		3 (3.6)	15 (10.8)	
No	232 (92.1)	305 (87.1)		80 (96.4)	124 (89.2)	
Previous suicidal attempt			0.87			0.10
Yes	109 (44.1)	150 (43.1)		36 (45.6)	80 (57.1)	
No	138 (55.9)	198 (56.9)		43 (54.4)	60 (42.9)	
History of psychiatrist's care			0.03			0.23
Yes	148 (58.5)	114 (32.4)		52 (61.9)	99 (69.7)	
No	105 (41.5)	238 (67.6)		32 (38.1)	43 (30.3)	
History of psychiatric admission			0.01			<0.01
Yes	29 (12.9)	68 (21.5)		10 (15.4)	45 (36.3)	
No	196 (87.1)	249 (78.5)		55 (84.6)	79 (63.7)	
Current psychiatric medication use			<0.01			0.25
Yes	99 (51.0)	185 (60.7)		37 (55.2)	78 (67.2)	
No	95 (49.0)	120 (39.3)		30 (44.8)	38 (32.8)	
Family history of psychiatric disease			0.33			<0.01
Yes	21 (9.5)	39 (12.6)		7 (10.9)	32 (28.8)	
No	199 (90.5)	270 (87.4)		57 (89.1)	79 (71.2)	
Motivation of self-harm			0.74			0.08
Psychiatric	63 (25.6)	97 (26.8)		24 (28.6)	56 (40.0)	
Others	183 (74.4)	265 (73.2)		60 (71.4)	84 (60.0)	
Method of self-harm			<0.01			0.66
Violent	129 (49.6)	122 (34.7)		35 (42.7)	59 (45.7)	
Non-violent	131 (50.4)	230 (65.3)		47 (57.3)	70 (54.3)	
Psychiatric tentative diagnosis in ED			<0.01			<0.01
MDD	105 (39.2)	185 (50.0)		24 (27.6)	67 (46.2)	
Psychiatric disorder other than MDD	6 (2.2)	29 (7.8)		3 (3.4)	13 (9.0)	
Uninterrupted or absence of psychiatric disease	157 (58.6)	156 (42.2)		60 (69.0)	65 (44.8)	
Disposition of ED assessments			<0.01			1.00
Discharge	210 (77.8)	266 (71.7)		76 (87.4)	125 (86.2)	
Psychiatric ward admission	7 (2.6)	42 (11.3)		5 (5.7)	8 (5.5)	
General ward admission	20 (7.4)	19 (5.1)		3 (3.4)	6 (4.1)	
ICU admission	33 (12.2)	44 (11.9)		3 (3.4)	6 (4.1)	

SBP: systolic blood pressure; DBP: diastolic blood pressure; MDD: major depressive disorder; ICU: intensive care unit; A: alcohol group; NA: non-alcohol group; ED: emergency department.

TABLE 3. Factors associated with alcohol ingestion in patients who attempted suicide by multivariate logistic regression analysis.

	OR	(95% CI)	*p*-value
Visit beyond business hours	1.297	0.675–2.494	0.435
Medicaid beneficiary insurance	1.940	0.943–3.993	0.072
≥12 years education	2.049	1.191–3.524	0.010
Violent self-harm method	1.356	0.816–2.253	0.240
Non-familiar location of self-harm	2.474	0.982–6.233	0.055
History of psychiatrist's care	0.735	0.393–1.375	0.335
History of psychiatric admission	0.507	0.260–0.985	0.045
Current psychiatric medication use	1.268	0.676–2.379	0.459
Psychiatric tentative diagnosis in ED (reference: uninterrupted or absence of psychiatric disease)			
Psychiatric disorder other than MDD	0.293	0.079–1.094	0.068
MDD	0.626	0.386–1.013	0.057

MDD: major depressive disorder; OR: odds ratio; CI: confidence interval; ED: emergency department.

TABLE 4. Factors associated with alcohol ingestion in patients who engaged non-suicidal self-harm by multivariate logistic regression analysis.

	OR	(95% CI)	*p*-value
Age(years)	0.989	0.946–1.034	0.618
Male	7.711	2.476–24.008	<0.001
Being married or partnered	6.236	2.291–16.973	<0.001
≥12 years education	5.079	1.456–17.723	0.011
Ask for help	0.890	0.212–3.736	0.873
Family history of psychiatric disease	0.801	0.134–4.771	0.807
History of psychiatric admission	0.454	0.087–2.369	0.349
Psychiatric tentative diagnosis in ED (reference: uninterrupted or absence of psychiatric disease)			
Psychiatric disorder other than MDD	0.286	0.023–3.511	0.328
MDD	0.279	0.096–0.806	0.018

MDD: major depressive disorder; OR: odds ratio; CI: confidence interval; ED: emergency department.

SA group, we found that the percentage of patients admitted to the general ward or ICU rather than a psychiatric ward, was significantly higher in the alcohol group than in the non-alcohol group, suggesting an association between alcohol consumption and increased severity of injury or toxicity caused by self-harm behaviors in patients with suicidal intent. Contrastingly, there were no significant between-subgroup differences in the ED disposition in the NSSH group, suggesting that alcohol use had little impact on the severity of self-harm behaviors in patients without suicidal intent.

To investigate the relationship between alcohol consumption and suicide attempts, Bagge *et al.* [12] classified patients according to alcohol use and the underlying motive of alcohol use into alcohol use to facilitate suicide (FAC), non-FAC group (alcohol use for a purpose other than facilitating suicide), and no alcohol consumption (ALC) groups. They found that most of patients who consumed alcohol before their suicide attempt (73%) were from the non-FAC group. Compared with other groups, patients in the non-FAC group had the lowest suicidal intent and shortest near-term plans. In contrast, patients from the alcohol and non-alcohol groups has similar levels of suicidal intent and near-term suicidal plans in the FAC group. These findings indicated that suicide attempts related to alcohol consumption are heterogeneous, which could be majorly attributed to the motive for drinking. Moreover, they suggested that individuals who consumed alcohol to facilitate

their suicide attempts could not be assumed to be at low risk, even with a low blood alcohol concentration (BAC). However, in the previous study performed by Bagge *et al.* [12], the authors did not include patients who were engaged in NSSH.

Salles *et al.* [14] compared the suicidal intent scores among suicide attempters who consumed poison based on their alcohol consumption. The patients were classified into an alcohol and no-alcohol use group based on their BAC. Suicidal intent was assessed using the Pierce scale, which consists of objective circumstances, self-reported intent, and medical risk. They reported that the alcohol use group had a lower self-reported intent score than the no-alcohol use group but found no between-group differences in the objective circumstances and medical risk scores. Similar to the study of Bagge *et al.* [12], Salles *et al.* [14] only enrolled patients who verbally specified that they intended to kill themselves.

Greene *et al.* [15] conducted a meta-analysis and systematic review of the relationship between NSSH and alcohol consumption. Specifically, they examined the relationships between alexithymia, non-suicidal self injury (NSSI), and risk drinking. They hypothesized that individuals could move between NSSI and risky drinking if baseline emotional problems were not treated. They observed a positive correlation between total alexithymia scores and difficulties in identifying/describing feelings with NSSI and risk drinking. Moreover, the associations with NSSI were stronger than those with risk drinking. However, they also observed that externally oriented thinking was associated with risky drinking but not with NSSI. Kuntsche *et al.* [16] reported a similar relationship, where individuals who tended to be externally and internally focused were likely to choose indirect (*e.g.*, drinking: indirect body injury) and direct control behaviors (*e.g.*, self-harm: direct body injury), respectively. In this present study, our findings suggested that patients who engaged in NSSH after consuming alcohol exhibited both direct and indirect control behaviors, which increased their medical risks.

Urban *et al.* [17] conducted a study to investigate the impact of acute alcohol use in suicidal patients. They compared patients who were positive in universal screening for suicide risk among patients who visited ED from 2014 to 2015 and divided them into an acute or non-acute alcohol use group. Their results showed that patients with acute alcohol use were less likely to undergo thorough suicide risk assessments. Moreover, in regard to ED disposition, medical ward, observation or ICU admission and admission to a substance abuse facility were statistically significantly higher in the acute alcohol use group than in the non-acute alcohol use group. However, the psychiatric ward admission was lower in the acute alcohol use group. The results of this ED disposition were similar to those of the SA patient group in this study.

In this study, individuals with $\geq$12 years of formal education were at a higher risk of drinking alcohol than their less-educated counterparts in both the SA and NSSH groups. We investigated the factors related to alcohol use only in patients who engaged in self-harm behaviors, and our results showed that the odds of consuming alcohol during or before self-harm behaviors increased with an increasing education level regardless of suicidal intent. Dambrauskiene *et al.* [18] investigated the association between suicide attempts and alcohol use disorders. They screened patients with drinking problems using the Cut down, Annoyed, Guilty, and Eye-opener (CAGE) questionnaire, which facilitated the diagnosis of alcohol use disorder. They found that the suicide attempt rate was 3.18 and 3.64 times higher in men and women, respectively, with a high school diploma or higher ($\geq$12 years of formal education) compared with their less-educated counterparts among individuals without drinking problems. On the other hand, the suicide attempt rate was 2.58 times higher in women with a high school diploma or higher ($\geq$12 years of formal education) compared with less-educated women among individuals with drinking problems. However, among patients with $<$12 years of formal education, the suicide attempt rate was 3.86 times higher among those with a drinking problem than among those without a drinking problem.

We also found that individuals with a history of psychiatric hospitalization and suspected depression in the SA and NSSH group were at higher odds of having not consumed alcohol during or before their self-harm behaviors, which was consistent with previous reports. Crombie *et al.* [19] reported that patients with a history of psychiatric hospitalization were less likely to consume alcohol before their suicide attempt. Further, Mendelson and Rich reported that patients with depression were less likely to have consumed alcohol before their suicide attempt compared to those without depression [20]. These differences could be attributed to the various purposes of drinking before a suicide attempt because alcohol can be used for varying purposes, including facilitating suicide by allaying fear and alleviating pain. These findings could be attributed to patients with a history of psychiatric hospitalization or depression being less dependent on features such as alcohol drinking.

In our study, men had 7.7 times higher odds than women of consuming alcohol before engaging in NSSH. This observation was consistent with the results reported by Whitlock *et al.* [21] regarding the relationship between NSSI and alcohol use. Whitlock *et al.* [21] reported that the odds for NSSI were four times higher (95% CI: 2.3–6.8) among male students than female students and that alcohol use influenced NSSI in 18% of the students. Haw *et al.* [22] investigated the relationship between self-harm and alcohol consumption in patients aged $\geq$15 years using data obtained between 1989 and 2002 from the Oxford Monitoring System. They found that 53.6% and 41.0% of men and women had consumed alcohol within 6 hours of self-harm. They also reported that patients with alcohol use disorder or those engaging in problematic drinking were more likely to consume alcohol when engaging in self-harm behaviors, which could be attributed to gender differences. However, although the rate of alcohol use within 6 hours of self-harm remained relatively steady from 1989 to 2002 in men, it increased in women across all age groups suggesting that this sex ratio could change in the future.

In the NSSH group, being married or living with someone was strongly associated with drinking (OR; 6.2) compared to being single. Oreskovich *et al.* [23] compared the prevalence of substance use disorder according to specialty among physicians. Consistent with our findings, alcohol abuse or dependence was independently associated with being married (OR: 1.296; p = 0.0424) or living with someone (OR: 1.989;

$p = 0.0003$). Furthermore, Dambrauskiene *et al.* [18] reported that alcohol use disorder increased the risk of suicide attempts by 3.17 times in married individuals or those unmarried but living together. This could be attributed to patients with a family being more vulnerable to criticism or stigma if they have drinking problems.

This study had several limitations. First, it was a retrospective study, the amount of alcohol consumed was unknown, and only the use of alcohol according to the patient's or caregiver's statement was known. Therefore, there may be a risk of false negativity and positivity in the reported results. Second, we did not investigate the prevalence of chronic alcohol use disorders. The impact of acute alcohol use may differ between patients with and without alcohol use disorders. Third, we did not determine the amount of alcohol consumed, which may have affected suicidal intent. Finally, this study was conducted in a single hospital in a large city and the findings may not be representative of the nationwide EDs, including those of rural regions.

5. Conclusion

The effects of alcohol use on ED disposition varied according to suicidal intent among patients admitted to the ED for self-harm behaviors. We observed that alcohol consumption increased the severity of suicidal intent in the SA group but not in the NSSH group. Patients with a higher education level were more inclined to consume alcohol during self-harm, regardless of suicidal intent.

AUTHOR CONTRIBUTIONS

DS—wrote the first manuscript. JIL—supported revision of the manuscript. DHL and HJK—designed the research study, analyzed the data, equally. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. HJK and DHL contributed equally as corresponding authors.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the institutional review board (IRB) of Ewha Womans' University Mok-dong hospital and Sangye Paik hospital (no: 2020-03-009). We acquired the informed consent for the patients or their guardians for data collection.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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