

The association of alcohol drinking pattern and self-inflicted intentional injury in Korea: a cross-sectional WHO collaborative emergency room study

Sungsoo Chun,^{1,2} Easton A Reid,^{2,3} Mieun Yun²

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¹Department of Health Management, Sahmyook University, Seoul, Korea
²Korean Institute on Alcohol Problems, Sahmyook University, Seoul, Korea
³Faculty of Science, Asia Pacific International University, Muak Lek, Saraburi, Thailand

Correspondence to
Dr Easton A Reid;
e.reid@apiu.edu,
ear_su@hotmail.com

ABSTRACT

Objectives: Self-inflicted intentional injuries are increasing at an alarming rate in the Republic of Korea, yet few reports describe their relationship with alcohol consumption. The aim of this study was to characterise the association of alcohol drinking patterns and self-inflicted intentional injury in Korean emergency departments (EDs) using WHO collaborative study protocol.

Design: Cross-sectional study.

Setting: Data were collected from four general hospital EDs in four geographically diverse regions of Korea: Seoul, Suwon, Chuncheon and Gwangju.

Participants: Information was collected on 1989 patients aged 18 and above. A representative probability sample was drawn from patients admitted to each ED for the first time within 6 h of injury.

Primary and secondary outcome measures: Alcohol-related non-fatal injuries.

Results: Among 467 persons with alcohol-related injuries, 33 (7.1%), were self-inflicted intentional injuries and 137 (29.3%) were intentional injuries caused by someone else. The adjusted odds of self-inflicted intentional injury verses unintentional injury were calculated for heavy (OR 1.764; 95% CI 0.783 to 3.976), binge (OR 2.125; 95% CI 0.930 to 4.858) and moderate drinking (OR 3.039; 95% CI 1.129 to 8.178) after controlling for demographic variables. Similar odds were reported for pooled intentional injury data (self-inflicted and caused by someone else) and drinking patterns.

Conclusions: These data show a strong association between all patterns of acute alcohol consumption and self-inflicted intentional injury in the Republic of Korea.

INTRODUCTION

Alcohol-related intentional and unintentional injuries are an increasing public health concern.^{1–3} While intentional injury has a visible human motivation and may be self-inflicted (eg, suicide) or caused by another (eg, homicide and assault), unintentional injury is without human motivation

ARTICLE SUMMARY

Article focus

- The risk of self-inflicted intentional injury in patients presenting to Korean emergency departments (EDs) shows a strong and significant association with moderate, binge and heavy alcohol drinking patterns.

Key messages

- Among Koreans presenting to EDs, the highest risk of self-inflicted intentional injury was associated with moderate alcohol drinkers, followed by binge and heavy drinkers.
- Integrated ED national surveillance systems as well as computerised Screening, Brief Intervention and Referral to Treatment (SBIRT) programmes are recommended to blunt the trends of Korean alcohol consumption and alcohol-related injuries which are increasing in all age categories.

Strengths and limitations of this study

- This study was limited by its cross-sectional design but strengthened by its use of internationally standardised protocol from the WHO Collaborative Emergency Room Study.
- The use of urban general hospitals limited rural generalisability, but provided access to a high volume of patients with alcohol-associated, self-inflicted intentional injuries.
- Patients presenting to EDs tend to over-represent alcohol use disorders compared with the general population, however, over-representation enabled identification of alcohol-associated self-inflicted intentional injuries in under-represented female Koreans.

(eg, traffic accidents, falls, drowning and most poisonings).⁴ It is estimated that 10–18% of injured patients who visit emergency departments (EDs) are alcohol-related.⁵ Alcohol-injury patients are more likely to report heavy consumption patterns prior to injury, and are less likely to use healthcare services other than EDs.⁶ Hence,

alcohol-related injuries presenting to Korean EDs are ideal for sampling and estimating national injury.

Having led OECD countries, Korean suicidal intentional injuries leaped from 10/100 000 (1990) to 31/100 000 (2010).⁷ Similarly, high-risk drinking among Korean adults rose from 14.9% in 2005 to 19.7% in 2008.⁸ Several reports have associated both acute and chronic alcohol consumption with suicidal intentional injury.^{9–11} Alcohol dependents have a 7% lifetime risk for completing suicide and 6.5 times greater risk for attempting suicide compared with non-dependents.¹² High-risk drinking pulled hazard ratios of suicide mortality higher compared with never-drinkers in a prospective Korean cohort of over one million men and women.¹³ Average alcohol volume consumption and antecedent drinking have been clearly linked to suicidal self-inflicted injury.¹

In contrast, non-suicidal self-injury thoughts and subsequent behaviour are infrequently associated with alcohol.^{14–15} Leading aetiological factors include regulation of negative affective states, poor social support and interpersonal conflict.^{16–18}

As with intentional injury, unintentional injury risk increases in a dose–response manner with blood alcohol concentration (BAC). Even at low BAC, unintentional injury risk increases significantly compared with persons with no measureable BAC.^{11–19} An increase in BAC from 0% to 0.01% has been associated with serious injury.²⁰

To date, few studies have characterised the association of alcohol and intentional injuries in Asia, including Korea. The incidence and prevalence of high-risk alcohol consumption and self-inflicted intentional injuries in Korea motivated the investigators to conduct a national ED study to characterise their association. The goal of this study was to determine the risk of self-inflicted intentional injuries with alcohol drinking patterns among patients presenting to Korean EDs.

METHODS

Study design and patient samples

This investigation was conducted in Korea as a WHO collaborative emergency room study using a cross-sectional study design.²¹ Data were collected from October 2008 through July 2009 from four general hospital EDs in geographically diverse regions of Korea: Seoul, Suwon, Chuncheon and Gwangju. A representative probability sample was drawn from patients admitted the first time to each ED within 6 h of an injury, with a target sample size of 500 per site. To avoid selection bias, consecutive sampling of ambulance arrivals and walk-in patients occurred during weekday and weekend shifts in each hospital.

Interviewers were trained and supervised by the WHO ED study coordinator who ensured data quality and schedule progress. Technical details of the WHO Collaborative Study on Alcohol and Injury can be found elsewhere.²¹

This study was approved by the Sahmyook University Institutional Review Board (IRB # SYU08-00001). Individual sites consulted local ethics committees regarding unconscious and ventilated patients to obtain permission from relatives, the doctor or the medical superintendent of the hospital.

In all, 3004 patients were approached to participate in the study but information was collected from 1989 consenting patients who were 18 and older, representing a 66.2% response rate. Fourteen patients were unable to describe the precipitating factors for their injury, giving a smaller sample of 1975 patients. All patients gave informed consent prior to study inclusion.

Survey instruments and measurement

Patients were assessed for alcohol intoxication by a nurse or physician using ICD-10 Y91 codes. BAC breath specimens were taken by a field worker using an ALCO-SENSOR III breathalyser, and a field worker conducted questionnaire interviews for alcohol drinking patterns. Hangul-translated questionnaires were used and individual project sites were permitted to insert additional questions of local interest. Each project site was responsible for finalising its own questionnaire.

Two field workers continued the interview process using ICD-10 Y91 categories and were assigned to each shift as 'Field Worker A' and 'Field Worker B.' Field Worker A in the triage area registered, approached, then explained the study to each patient to obtain informed consent. Patients who refused completed section A (registration form) and section B (screening) before interview termination. These forms were kept and filed separately.

For consenting patients, Field Worker B continued the interview, breathalysed the patient, collected Y90 coding data for observational assessment (Y91), then ended the interview. When an interview was not possible a non-interview report was completed by 'Field Worker B.' If 'Field Worker A' had time, she/he assisted 'Field Worker B.' Patient contact from consent to completion ranged from 3 to 80 min and averaged 20 min.

Variables

Alcohol pattern and intentional injury

Injury was categorised as alcohol-related if the patient reported drinking alcohol 6 h before injury, or if the breathalyser reading was >0.01%. Intentional injury was categorised to include both self-inflicted injuries and injuries by someone else; all other injuries were categorised as unintentional.

Ethanol intake

Usual past-year volume of ethanol intake (in milliliters) was computed as (% pure alcohol) × (drink size) × (number of drinks consumed) for each beverage type consumed per drinking occasion in the past 12 months. These calculations determined the standard amount of

alcohol (12 g of ethanol) per glass and the drinking frequency to establish consumption patterns.

Sociodemographic characteristics

The sociodemographic characteristics considered were the following: gender (male vs female), age (18–29, 30–39, 40–49, 50–59 and 60 and over), education (0–6, 7–9, 10–12, 13 and more years), employment: 30 h or more a week in a paid job (yes vs no), residence (urban vs rural), someone else (spouse, partner (past or present); parent, step-parent; other relatives; friend, acquaintance; stranger; unknown).

Drinking habits

For the purposes of this study, moderate, binge and heavy drinking were evaluated during the past 12 months as drinking 2, 5 and 10 or more standard glasses per occasion, respectively.

Statistical analysis

SPSS V.13.0 was used for two-sided statistical analysis. Logistic regression models determined OR estimates while multilogistic regression analysis adjusted OR by controlling for gender, age (less than 50 vs 50 or above), employment and residence. Exposure strata contained 95% CI determined from dichotomous variables of intentional and unintentional injury. Categorical data were further analysed using χ^2 , and Fisher's exact tests (not shown) were used to test statistical significance. A $p < 0.05$ was accepted as statistically significant.

RESULTS

Intentional injuries by others outpaced self-inflicted intentional injuries (6.9% vs 1.7%, respectively); however, most patients suffered unintentional injuries. Injuries from friends were almost as notable as harm from strangers (43.8% vs 40.1%, respectively). Most injured persons (59%) reported their assailants were 'definitely drunk' (table 1).

Descriptive data for sociodemographic variables of intentional and unintentional injuries revealed a sample that was 61.4% men, 88.2% urban, 70.4% less than 50 years of age and 46.3% who worked 30 or more hours a week. There was a significant difference in gender hospital admittance ($p = 0.031$); men reported greater, self-inflicted intentional injury (66.7%) and intentional injury caused by others (71.5%), relative to women (33.3% and 28.5%, respectively).

Age groups showed significant differences ($p = 0.018$). The risk of self-inflicted intentional injury was the highest among those aged 18–29 years (33.3%) and the lowest for individuals aged 50–59 years (6.1%). Injury inflicted by someone else was the highest among those aged 40–49 years (29.2%) and 18–29 years (28.5%) and least in individuals 60 years or older (5.1%; table 2).

The proportion of alcohol consumption in patients presenting 6 h prior to self-inflicted intentional injury

Table 1 Status of unintentional and intentional injuries

Questions and responses	Person (%)
Why were you injured?	
Unintentional	1805 (91.4)
Intentional self-inflicted	33 (1.7)
Intentional by someone else	137 (6.9)
Subtotal	1975
Who was the person who harmed you or fought with you?	
Spouse, partner (past or present)	9 (6.6)
Parent, step parent	2 (1.5)
Other relative	3 (2.2)
Friend, acquaintance	60 (43.8)
Stranger	55 (40.1)
Unknown	8 (5.8)
Subtotal	137
In your opinion, had the person(s) who harmed you or you fought with, been drinking alcohol?	
Yes, definitely	81 (59.1)
Suspected	17 (12.4)
No	29 (21.2)
Do not know, unsure	10 (7.3)
Subtotal	137

(63.6%) or intentional injury by someone else (68.6%) was greater than unintentional injury (19.8%). The opposite effect was seen with self-inflicted intentional injuries (36.4%) and injuries by others (31.4%) not associated with alcohol consumption when compared with unintentional injuries (80.2%). Similar trends in the proportions for alcohol intoxication were corroborated with self-report surveys, breathalyser levels and clinical Y91/ICD 10 diagnoses (table 3).

The adjusted odds of self-inflicted injury were greater for drinkers (OR 3.207; 95% CI 0.912 to 11.279) compared with non-drinkers. A drinking frequency of once or more a week (OR 1.480; 95% CI 0.680 to 3.223) had a higher adjusted odds of injury compared with those drinking less than once a week. There were decreasing odds of self-inflicted injury from moderate drinkers (OR 3.039; 95% CI 1.129 to 8.178), binge drinkers (OR 2.125; 95% CI 0.930 to 4.858) and heavy drinkers (OR 1.764; 95% CI 0.783 to 3.976; table 4).

DISCUSSION

In the present study, alcohol use is associated with a significant proportion (19%) of emergency services due to self-inflicted intentional injury. A sentinel ED study by Lee *et al*²² found 19% of presenting patients attempted suicide in Korea. Interestingly, the leading reasons for Korean suicidal, intentional injury evolve from conflicts in familial and friendship social networks.²³

In our study, males reported greater alcohol-related injuries. This finding mirrored data from the Korean government report (2009) showing 25 322 (18.7%) men and 13 104 (13.1%) women died from alcohol-related diseases and injuries.²⁴ Gender differences were

Table 2 Differences between unintentional injury and intentional injury by selected sociodemographic variables unit: person (%)

	Unintentional injury	Intentional injury		Total	χ^2 (p value)
		Self-inflicted	By someone else		
Gender					
Male	1093 (60.5)	22 (66.7)	98 (71.5)	1212 (61.4)	6.94 (0.031)
Female	713 (39.5)	11 (33.3)	39 (28.5)	763 (38.6)	
Age					
18–29	512 (28.4)	11 (33.3)	39 (28.5)	562 (28.5)	18.46 (0.018)
30–39	360 (19.9)	8 (24.2)	34 (24.8)	402 (20.4)	
40–49	377 (20.9)	8 (24.2)	40 (29.2)	425 (21.5)	
50–59	269 (14.9)	2 (6.1)	17 (12.4)	288 (14.6)	
60 and over	287 (15.9)	4 (12.1)	7 (5.1)	298 (15.1)	
Education					
0–6 years	196 (11.0)	2 (6.3)	7 (5.1)	205 (10.5)	8.38 (0.212)
7–9 years	138 (7.7)	2 (6.3)	14 (10.2)	154 (7.9)	
10–12 years	638 (35.7)	15 (46.9)	57 (41.6)	710 (36.3)	
13 years and over	813 (45.5)	13 (40.6)	59 (43.1)	885 (45.3)	
Employment (30 h or more a week in a paid job)					
Yes	836 (46.5)	20 (60.6)	54 (39.7)	910 (46.3)	5.13 (0.077)
No	961 (53.5)	13 (39.4)	82 (60.3)	1056 (53.7)	
Residence					
Urban area	1555 (87.8)	30 (96.8)	125 (92.6)	1710 (88.2)	5.04 (0.08)
Rural area	217 (12.2)	1 (3.2)	10 (7.4)	228 (11.8)	
Total	1805 (91.4)	33 (1.7)	137 (6.9)	1975	

reported in the USA where ED injuries were greater for men up to the age of 65.²⁵ Lee *et al*²² found greater Korean female ED visitation due to injury with no alcohol consumed. World-wide, alcohol-attributable intentional injuries (2002) weighed heavily upon men (6 365 806 DALYs) in comparison to women (1 050 845 DALYs).²⁶ Li *et al*²⁷ in Eastern Taiwan found that of total alcohol-related ED injuries, assaults accounted for more than half of male and one-third of female visitors.²⁷ In Korea, men are the lead actors in a socially acceptable binge and heavy drinking culture.^{28–29} Occult excessive drinking for women may be due to home preloading.³⁰ We are currently investigating gender-specific alcohol consumption patterns in the general Korean population. Overall, increased alcohol consumption and problem drinking significantly affected intentional and unintentional injury in both genders.

All patterns of alcohol consumption increased the adjusted odds of self-inflicted and pooled intentional injury (self-inflicted and caused by someone else). The ratios from this report are higher than the pooled analysis of 15 international studies which followed ED WHO protocol (OR 2.1; 95% CI 1.6 to 2.7).² Differences may reflect variations in alcohol consumption frequency, pattern, culture, national policy and available patient services.⁵

The characterisation of alcohol-related injury in this study shows Korean EDs must be further integrated into a national surveillance system to reduce the burden of intentional and unintentional alcohol harms.³¹ Positive BAC patients have a range of pathologies that provide prime opportunities for brief interventions to reduce ED recidivism.³² Recently, a computerised alcohol Screening, Brief Intervention and Referral to Treatment

Table 3 Alcohol intoxication rate by injury causality unit: person (%)

	Unintentional injury	Intentional injury		Total	χ^2 (p value)
		Self-inflicted	By someone else		
In the 6 h before and up to you having your injury/accident, did you have any alcohol to drink-even one drink?					
Yes	352 (19.8)	21 (63.6)	94 (68.6)	467 (23.9)	195.79 (0.000)
No	1429 (80.2)	12 (36.4)	43 (31.4)	1484 (76.1)	
Breathalyser level					
Alcohol intoxicated	234 (14.0)	17 (56.7)	70 (59.3)	321 (17.6)	188.69 (0.000)
Not intoxicated	1443 (86.0)	13 (43.3)	48 (40.7)	1504 (82.4)	
Diagnosis (Y91, ICD 10)					
Alcohol intoxicated	294 (16.5)	18 (56.3)	88 (65.2)	400 (20.5)	208.00 (0.000)
Not intoxicated	1489 (83.5)	14 (43.8)	47 (34.8)	1550 (79.5)	
Total	1805 (91.4)	33 (1.7)	137 (6.9)	1975 (100.0)	

ICD, International Classification of Diseases.

Table 4 Unadjusted and adjusted OR and 95% CI for correlates of intentional injury versus unintentional injury with corresponding drinking habits

	Pooled intentional injury (self-inflicted and by someone else) vs unintentional injury		Self-inflicted intentional injury vs unintentional injury	
	OR	Adjusted OR	OR	Adjusted OR
Drinker				
Non-drinker	1	1	1	1
Drinker	3.603 (2.064 to 6.290)	3.038 (1.688 to 5.466)	3.034 (0.922 to 9.986)	3.207 (0.912 to 11.279)
Drinking frequency				
Less than once a week	1	1	1	1
Once a week	2.575 (1.870 to 3.548)	2.463 (1.728 to 3.511)	1.569 (0.789 to 3.125)	1.480 (0.680 to 3.223)
Moderate drinking				
Less than 2 standard glasses at one session	1	1	1	1
2 standard glasses	3.167 (2.101 to 4.77)	2.932 (1.860 to 4.621)	2.740 (1.126 to 6.669)	3.039 (1.129 to 8.178)
Binge drinking				
Less than 5 standard glasses at one session	1	1	1	1
5 standard glasses	2.457 (1.772 to 3.407)	2.289 (1.570 to 3.336)	1.981 (0.980 to 4.004)	2.125 (0.930 to 4.858)
Heavy drinking				
Less than 10 standard glasses at one session	1	1	1	1
10 standard glasses or more at one session	2.829 (2.043 to 3.919)	2.753 (1.933 to 3.920)	1.547 (0.731 to 3.276)	1.764 (0.783 to 3.976)

Adjusted OR controlled by gender, age (under 50 vs 50 or over), employment and residence.

(SBIRT) programme has been piloted in busy, urban EDs and proved effective and efficient in educating patients about injury risks. Such interventions are needed to reverse the trends of high prevalence, under-treatment and increasing injuries given alcohol misuse in all Korean age categories, including juveniles.^{33 34} The highly technological environment of Korea would be fertile for employing these interventions in future studies to assess and reduce alcohol-associated injuries.

A prospective study design using an increased number of EDs would strengthen study outcomes.

In addition, patient under-reporting and/or refusal to participate may have influenced records, given related implications for insurance costs and other liabilities. This study was limited by its cross-sectional design but strengthened by its use of internationally standardised protocol from the WHO Collaborative Emergency Room Study. While urban general hospitals limited rural generalisability, urban EDs provided access to a high volume of patients with alcohol-associated intentional injuries. Patients presenting to EDs tend to over-represent alcohol use disorders compared with the general population, however, over-representation enabled identification of alcohol-associated self-inflicted intentional injuries in under-represented female Koreans.^{6 35 36} Another challenge was the confounding effect of other drugs in the clinical assessment of alcohol use, intoxication and patient injury. This would be ripe for future research.

Altogether, the use of WHO protocol in our study proved practical for implementation in different ED settings in Korea. These data show a strong association between acute alcohol consumption and intentional injury among ED patients in the Republic of Korea.

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