Observational Study

Medicine®

OPEN

Gender-specific relationship between alcohol consumption and injury in the South Korean adults

A nationwide cross-sectional study

Eun Young Rha, MD, PhD[a], Ho Jun Kim, MD[a], Kyungdo Han, PhD[b], Yongkyu Park, PhD[b], Gyeol Yoo, MD, PhD[c,*]

Abstract

Alcohol-related injuries have been concerned worldwide. However, there have been no large cross-sectional epidemiologic studies. The aim of this study was to investigate the association between alcohol and the prevalence of injury according to gender in a representative sample of the South Korean population. This cross-sectional study was based on data obtained in the Korea National Health and Nutrition Examination Survey from 2010 to 2012. In total, 15,249 Korean adults (7128 men and 8112 women) aged 19 years or older were enrolled. Injury was defined as the incidence of an injury or intoxication within the year before completing the survey questionnaire. Univariate and multiple logistic regression analyses were conducted to analyze the relationship between alcohol consumption and the prevalence of injury. Heavy alcohol consumption and high-risk drinking were associated with a higher prevalence of injury in women (adjusted odds ratio [aOR] and corresponding 95% confidence interval [CI]: 2.48 [1.321, 4.656], 1.816 [1.136, 2.929], respectively), and Alcohol Use Disorders Identification Test (AUDIT) scores ≥20 were associated with a higher prevalence of injury in both men and women (aOR and 95% CI: 1.425 [1.004, 2.024] and 3.71 [2.067, 6.66], respectively). According to the AUDIT scores results, women who were injured reported significantly more high-risk drinking behaviors per month compared with those who were not injured. Gender disparities in the relationship between alcohol and the prevalence of injury were found. Indeed, future research using a prospective design should examine the causal relationship between alcohol consumption and the prevalence injury according to gender to confirm that alcohol is a risk factor for injury and to identify the possible mechanisms underlying this phenomenon.

Abbreviations: AUDIT = Alcohol Use Disorders Identification Test, BMI = body mass index, CI = confidence interval, GBD = Global Burden of Disease, KNHANES = Korea National Health and Nutrition Examination Survey, OR = odds ratio, WC = waist circumference.

Keywords: alcohol, gender, injury

1. Introduction

A large proportion of adults in many countries consume alcohol. However, the prevalence of drinkers and the amount of alcohol consumption per capita in the Republic of Korea are among the highest worldwide, and the prevalence of alcohol consumption has been increasing.[1] Alcohol is one of the leading causes of the Global Burden of Disease (GBD), as it accounts for 3.9% of the GBD.[2]

Injury is a major contributor to morbidity, disability, and even early mortality.[3] Injuries are categorized as intentional and unintentional. Intentional injuries include road traffic injuries, drowning, burns, poisoning, and falls. Unintentional injuries result from deliberate acts of violence against oneself or others.[4] Injuries constitute a major part of alcohol-attributable disability-adjusted life years (33.2%) and alcohol-attributable mortality (24.4%).[5] Of the total number of alcohol-attributable deaths, unintentional injuries constitute 32.0% and intentional injuries constitute 13.7%.[4] Alcohol affects psychomotor skills, including reaction time, as well as cognitive skills, such as judgment. Consequently, individuals under the influence of alcohol tend to be exposed to situations that present a high risk for injury.[6]

In this study, we aimed to investigate the relationship between alcohol consumption and the prevalence of injury according to gender in the South Korean population based on data from the 2010 to 2012 Korea National Health and Nutrition Examination Survey (KNHANES).

Editor: Bishwajit Bhattacharya.

Disclosure: None of the authors has a financial interest in any of the products, devices, or drugs mentioned in this manuscript.

The authors have no conflicts of interest to disclose.

[a] Department of Plastic and Reconstructive Surgery, Incheon St. Mary's Hospital, [b] Department of Biostatistics, [c] Department of Plastic and Reconstructive Surgery, Yeouido St. Mary's hospital, College of Medicine, The Catholic University of Korea, Seoul, South Korea.

[*] Correspondence: Gyeol Yoo, Department of Plastic and Reconstructive Surgery, Yeouido St. Mary's hospital, College of Medicine, The Catholic University of Korea, Seoul, South Korea (e-mail: psyg@catholic.ac.kr)

Medicine (2017) 96:14(e5385)

Received: 25 April 2016 / Received in final form: 17 October 2016 / Accepted: 20 October 2016

http://dx.doi.org/10.1097/MD.0000000000005385

2. Materials and methods

2.1. Study participants

This study was based on data acquired from the 2010 to 2012 KNHANES V, which was conducted by the Korea Centers for Disease Control and Prevention. The KNHANES is an ongoing, population-based, cross-sectional nationwide study of noninstitutionalized South Korean civilians. A complex, stratified, multistage, cluster sampling design with proportional allocation based on the National Census Registry was used for the selection of household units.

Trained interviewers conducted fact-to-face interviews, health examinations, and nutrition surveys at participants' homes using structured questionnaire. In total, 25,534 participants completed these surveys. Individuals younger than 19 years of age (n = 5935) were excluded, and an additional 4359 participants were excluded due to missing values for variables, yielding a final study population of 15,240 participants (7128 men and 8112 women). The Institutional Review Board of The Catholic University of Korea approved this study (SC15EISI0140).

2.2. Definition of injury

This study identified the incidence of injury or intoxication among participants within the year before completion of the KNHANES questionnaire. Individuals who reported sustaining an injury within the past year were categorized according to whether they were hospitalized.

2.3. Demographic variables

Data on the demographic and socioeconomic characteristics and medical history of participants were collected by trained interviewers. Self-report questionnaires were used to determine participants' age, sex, alcohol consumption, smoking status, waist circumference (WC), body mass index (BMI), physical activity, residential area, marital status, occupation, and socioeconomic status.

The amount of pure alcohol consumed (g/d) was calculated using the average number of alcoholic beverages consumed and the frequency of alcohol consumption. Participants were categorized into the following 3 groups according to their daily alcohol consumption: nondrinker, light-to-moderate drinker (1–30 g/d), and heavy drinker (>30 g/d).[7]

Binge drinking was defined as consuming ≥7 drinks/drinking day for men and ≥5 drinks/drinking day for women at a sitting more than twice per week.[8,9]

The Alcohol Use Disorders Identification Test (AUDIT) was used to assess patterns of alcohol use and to divide the participants into 4 levels. The AUDIT score is calculated by summing the scores of 10 questions concerning alcohol consumption, including those about the frequency of consumption and the amount of alcohol consumed per occasion (AUDIT score tier levels: 0–7, 8–14, 15–19, and ≥20).[10–12] Three domains, including hazardous alcohol use, dependence symptoms, and harmful alcohol use, are included in the AUDIT, which consists of 10 questions about recent alcohol use, alcohol dependence symptoms, and alcohol-related problems.[12]

Subjects who were currently smoking and had smoked >100 cigarettes in their lifetime were defined as current smokers.

Height, weight, and WC were measured using standard procedures. Height was measured with an accuracy of 0.1 cm, and weight was measured to the nearest 0.1 kg. WC was measured at the midpoint of the lower margin of the 12th rib and the iliac crest in the mid-axillary line at the end of expiration. BMI was calculated as weight in kilograms divided by height in meters squared. Total caloric intake and the proportions of energy obtained from carbohydrates, protein, and fat were also estimated. Physical activity was categorized as regular exercise and nonregular exercise. Regular exercise was defined as exercising more than 3 times per week for more than 20 minutes at a time. Place of residence was categorized either as rural or urban, and marital status was categorized as either married or single.

Hypertension was defined by systolic blood pressure ≥140 mm Hg, diastolic blood pressure ≥90 mm Hg, or current use of antihypertensive medicines. Diabetes was defined by fasting plasma glucose levels ≥126 mg/dL with diabetes treatment or diagnosis by a physician. Metabolic syndrome was defined according to the American Heart Association/National Heart, Lung, and Blood Institute scientific statement criteria for Asians.[13] Participants with household incomes in the lowest quartile were defined as the low-income group, and those who did not attend school beyond middle school (higher than ninth grade) were defined as the low-education group.

2.4. Statistical analyses

All analyses were performed using SAS software version 9.3 (SAS Institute Inc., Cary, NC). All data are presented as means ± standard errors of the mean for continuous variables and as percentages and standard errors for categorical variables. The SAS survey procedure reflected the complex sampling design and the sampling weights of the KNHANES and provided nationally representative prevalence estimates. The Student *t* test or the Rao–Scott chi-square test was used for comparisons among groups. Univariate and multiple logistic regression analyses were used to estimate the association of injury with level of alcohol consumption and its individual components. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated after adjusting for potential confounders. In multiple logistic regression analyses, adjustments were made first for age (Model 1) and subsequently for the same variables in Model 1 plus BMI, exercise, smoking, education, and income (Model 2). A P value of <0.05 was considered statistically significant.

3. Results

Table 1 shows the general characteristics of participants according to gender and the presence of injury. The mean age of men and women who sustained an injury was 41.4 ± 0.8 and 45.6 ± 0.9 years, respectively. Males who had an injury had a higher WC and BMI and were more likely to smoke and live in rural area. Females who had an injury were more likely to smoke, be heavy drinkers, and have hypertension. Moreover, household income was significantly lower in women who have an injury than in women without an injury ($P < 0.05$). Both males and females with injuries were more frequently hospitalized due to an injury than a due to situation not associated with an injury (noninjury).

Table 2 shows the distribution of injury according to drinking pattern and AUDIT score among men and women. Individuals who experienced an injury tended to be binge drinkers and to have high AUDIT scores than individuals who had no injuries, and this was the case for both men and women.

Table 1

General characteristics of participants who experienced injury by gender.

	Men (n = 7128)			Women (n = 8112)		
Experience of injury	**No (n = 6612)**	**Yes (n = 516)**	***P***	**No (n = 7593)**	**Yes (n = 519)**	***P***
Age, y	44.1 ± 0.3	41.4 ± 0.8	<0.001	43.3 ± 0.3	45.6 ± 0.9	0.013
Smoking status						
Current smokers (n [%])	42.8 (0.8)	54.6 (2.6)	<0.001	6.1 (0.4)	9.9 (1.8)	0.01
Alcohol consumption						
Heavy drinkers (n [%])	18.8 (0.6)	22.8 (2.4)	0.084	2.6 (0.3)	6.5 (1.7)	<0.001
Physical activity						
Regular exerciser (n [%])	23.0 (0.7)	21.9 (2.1)	0.636	16.8 (0.5)	17.1 (2.3)	0.909
BMI, kg/m^2	24.0 ± 0.1	24.7 ± 0.2	0.004	23.2 ± 0.1	23.5 ± 0.2	0.065
WC, cm	84 ± 0.2	85.9 ± 0.6	0.002	77.4 ± 0.2	78.6 ± 0.6	0.052
Hypertension	30.4 (0.7)	28.2 (2.5)	0.413	19.7 (0.6)	24.2 (2.3)	0.037
Diabetes mellitus, %	9.4 (0.4)	10.1 (1.5)	0.638	5.6 (0.3)	7 (1.3)	0.267
Metabolic syndrome, %	26 (0.7)	28.2 (2.4)	0.371	21.6 (0.6)	26.3 (2.6)	0.061
Occupation (n [%])	78.3 (0.7)	81.3 (1.9)	0.154	53.3 (0.8)	52.1 (2.8)	0.683
Low education level	78.4 (0.7)	78.5 (2.2)	0.967	71.2 (0.8)	66.3 (2.6)	0.056
Low household income	13.6 (0.6)	13.1 (1.7)	0.772	14.8 (0.6)	18.7 (2.1)	0.035
Marital status						
Married	84.3 (0.9)	81.7 (2.7)	0.322	77.9 (0.8)	52.1 (2.8)	0.683
Place of residence						
Urban	80.8 (1.7)	74.8 (3.3)	0.013	82.1 (1.6)	82.7 (2.7)	0.824
Hospitalization						
No	93.2 (0.4)	48.2 (2.6)		90.1 (0.4)	57.2 (2.8)	
Yes: noninjury	6.7 (0.4)	8.5 (1.7)		9.9 (0.4)	9.2 (1.7)	
Injury		43.4 (2.7)			33.6 (2.5)	
Outpatient visit						
No	75 (0.7)	62.3 (2.7)		67.2 (0.7)	52.6 (2.8)	
Yes: noninjury	25 (0.7)	26.7 (2.4)		32.8 (0.7)	35.8 (2.6)	
Injury		11 (16)			11.5 (1.8)	

Values are presented as the mean (SEM) or percentage (SE). BMI = body mass index, WC = waist circumference.

Table 3 shows the distribution of the causes for hospitalizations and outpatient visits due to injury and noninjury according to drinking pattern and AUDIT score among men and women. Males and females who were hospitalized for an injury tended to be heavy drinkers compared with those hospitalized for a noninjury. Females who were hospitalized for an injury also had higher AUDIT scores compared with those hospitalized for a noninjury.

Table 4 shows the adjusted ORs (aORs) and 95% CIs for the prevalence of injuries according to drinking pattern and AUDIT level among men and women. In men and women, the aORs (95% CI) of injury for binge drinking were 1.401 (1.054, 1.863), 2.004 (1.288, 3.118), respectively in Model 1. In Model 2, the aORs (95% CI) in women for heavy alcohol consumption and binge drinking were 2.48 (1.321, 4.656) and 1.816 (1.136, 2.929), respectively. In men and women, the aORs (95% CI) for AUDIT scores ≥20 were 1.667 (1.183, 2.34) and 4.238 (2.409, 7.455), respectively, in Model 1 and 1.425 (1.004, 2.024) and 3.71 (2.067, 6.66), respectively in Model 2. This reflected a trend toward an association between increased alcohol consumption and binge drinking and a higher prevalence of injury in women and between high AUDIT scores and injury in both men and women.

Table 2

Prevalence of injuries according to drinking pattern and AUDIT score.

	Men			Women		
	Experience of injury or intoxication			Experience of injury or intoxication		
	No (n = 6612)	**Yes (n = 516)**	***P***	**No (n = 7593)**	**Yes (n = 519)**	***P***
Alcohol consumption			0.084			<0.001
None	9.4 (0.6)	6.9 (1.2)		19.3 (0.6)	20.2 (2.1)	
Light-to-moderate	71.8 (0.7)	70.3 (2.6)		78.2 (0.6)	73.3 (2.6)	
Heavy	18.8 (0.6)	22.8 (2.4)		2.6 (0.3)	6.5 (1.7)	
Binge drinker	25.3 (0.8)	32.4 (23.1)	0.019	7 (0.5)	12.5 (2.4)	0.004
AUDIT score			0.029			<0.001
0–7	44.7 (0.8)	38.3 (2.7)		83 (0.6)	77.7 (2.4)	
8–14	29.7 (0.7)	30.2 (2.5)		12.2 (0.5)	12.1 (1.8)	
15–19	14.6 (0.5)	15.9 (2.1)		2.9 (0.3)	3.9 (1.2)	
≥20	11 (0.5)	15.7 (2)		1.9 (0.2)	6.4 (1.6)	

Values are presented as percentages (SE). AUDIT = Alcohol Use Disorders Identification Test.

Table 3

Distribution of the causes for hospitalization and outpatient visits according to drinking pattern and AUDIT scores.

Hospitalization

	Male				Female			
		Yes				Yes		
	No (n=6363)	Noninjury (n=532)	Injury (n=233)	*P*	No (n=7187)	Noninjury (n=754)	Injury (n=171)	*P*
Alcohol consumption				<0.001				<0.001
None	8.7 (0.4)	16.8 (1.9)	8.1 (1.8)		18.1 (0.6)	31.2 (2.1)	16.4 (2.9)	
Light-to-moderate	72.4 (0.7)	65.8 (2.5)	66.1 (3.9)		79.2 (0.6)	66.5 (2.3)	75.3 (4)	
Heavy	19 (0.6)	17.5 (2.1)	25.8 (3.7)		2.7 (0.3)	2.3 (0.8)	8.2 (3.1)	
Binge drinker	25.7 (0.8)	24.5 (2.8)	33.5 (4.6)	0.138	7.3 (0.5)	6.2 (1.6)	14.6 (4.3)	0.063
AUDIT score				0.616				<0.001
0–7	44.3 (0.8)	44.7 (2.9)	38.4 (3.9)		82.5 (0.6)	86.7 (1.7)	74 (4.6)	
8–14	30 (0.7)	26.5 (2.3)	31.5 (4.3)		12.5 (0.5)	9.2 (1.4)	11.4 (3)	
15–19	14.5 (0.5)	15.9 (2.2)	17 (2.8)		3 (0.3)	2.6 (0.8)	2.8 (1.6)	
≥20	11.2 (0.5)	12.9 (1.9)	13.2 (3.1)		2 (0.2)	1.6 (0.7)	11.8 (3.7)	

Outpatient visit

	Male				Female			
		Yes				Yes		
	No (n=4944)	Noninjury (n=2124)	Injury (n=60)	*P*	No (n=5193)	Noninjury (n=2862)	Injury (n=57)	*P*
Alcohol consumption				<0.001				<0.001
None	7.6 (0.5)	13.8 (0.9)	10.8 (4.2)		17.6 (0.7)	23 (1)	13.6 (5.4)	
Light-to-moderate	72.8 (0.8)	67.9 (1.3)	84.1 (5.2)		79.7 (0.7)	74.1 (1.1)	81.2 (6.3)	
Heavy	19.6 (0.7)	18.4 (1.1)	5.1 (3.2)		2.7 (0.3)	2.9 (0.5)	5.2 (3.6)	
Binge drinker	26.3 (0.9)	24.5 (1.3)	25.8 (8.1)	0.535	7.1 (0.5)	7.8 (0.9)	11.3 (6.3)	0.561
AUDIT score				0.029				0.396
0–7	43.1 (0.9)	47.3 (1.4)	36 (7.5)		83.2 (0.7)	81.8 (1)	77.4 (7.5)	
8–14	30.5 (0.8)	27.2 (1.3)	39 (7.8)		11.7 (0.6)	13.1 (0.9)	10.6 (4.7)	
15–19	15 (0.6)	13.6 (1)	21.4 (7.2)		3.1 (0.3)	2.8 (0.4)	4.9 (4.7)	
≥20	11.3 (0.6)	11.9 (1)	3.6 (2.2)		2 (0.3)	2.3 (0.4)	7.1 (5)	

Values are presented as the mean (SEM) or percentage (SE). AUDIT = Alcohol Use Disorders Identification Test.

Figure 1 illustrates the monthly prevalence of the phenomena measured by the AUDIT, including dependence symptoms and harmful alcohol use according to experience of injury among men (Fig. 1A) and women (Fig. 1B). Women who experienced an injury reported significantly more high-risk drinking behaviors per month than did those with no injuries.

4. Discussion

This study found a possible association between alcohol intake and the prevalence of injury as a function of gender in a large sample.

Many recent studies have reported a causal relationship between alcohol and the risk of injury in emergency department trauma patients.[14–17] However, despite the facts that the proportion of Korean adults who consume alcohol is among the highest in the world and that both this percentage and the proportion of high-risk drinkers are increasing, relevant representative national data on Korean adults are lacking.[1,18] Among Korean adults, 81.6% of men and 52.4% of women drink alcohol. According to Korean statistical data, the mean amount of per capita alcohol consumption for men and women are 30.1 and 6.6 g/d, respectively, which may stem from the Korean drinking culture.

In this study, we found a positive relationship between high AUDIT scores and injury in both men and women, as well as a significant association between heavy and binge drinking and injury only in women. In both genders, hospitalization due to injury was related to the amount of alcohol consumed, and hospital admission was associated with high AUDIT scores, especially in women. Dependence symptoms and harmful alcohol use, which are included as AUDIT domains, were experienced once per month in women with injuries.

The gender-specific relationship between alcohol intake and the prevalence of injury can be explained by several factors. In Korea, binge and heavy drinking are socially acceptable only for men[19,20] due to the drinking culture based on Confucianism. Actually, Korean women who take part in social activities that include drinking may have a greater chance of exposure to harmful events than do socially inactive women. Moreover, women who drink excessively tend to consume alcohol at private residences before going out[21]; this “pre-loading” phenomenon is associated with higher alcohol consumption as well as increased adverse events, including involvement in physical fights.[22] Next, previous studies have reported that gender differences in alcohol drinking behavior are associated with biological and physiological predispositions. Biologic differences between men and women, such as the lower rate of alcohol metabolism in women, lead to higher blood alcohol levels in women compared with men consuming the same quantity of alcohol.[8,23–25] In some alcohol-related pathologies, women may be more vulnerable to the adverse effects of alcohol consumption compared with men. Ammendola et al[8] reported that women have a higher sensitivity to the toxic effects of ethanol on peripheral nerve fibers. However, the results of this study are not consistent with those of previous reports. According to worldwide data in 2002, alcohol-attributable intentional injuries were more common in men than in women.[4] Chun et al showed that males sustained more alcohol-related injuries, which mirrors data from the 2009 Korean government report.[15] The discrepancy in these results may be due to differences in the participant populations as well as to changes in the drinking culture. Although existing reports that describe the relationship

Table 4

OR (95% CIs) of injury according to alcohol consumption.

	Model 1*		Model 2†	
	Men	Women	Men	Women
Alcohol consumption				
None	1	1	1	1
Light-to-moderate	1.163 (0.795, 1.702)	0.963 (0.733, 1.265)	1.132 (0.763, 1.681)	0.952 (0.723, 1.252)
Heavy	1.45 (0.95, 2.211)	2.831 (1.557, 5.146)	1.268 (0.815, 1.973)	2.48 (1.321, 4.656)
Binge drinker	1.401 (1.054, 1.863)	2.004 (1.288, 3.118)	1.237 (0.925, 1.653)	1.816 (1.136, 2.902)
AUDIT score				
0–7	1	1	1	1
8–14	1.131 (0.86, 1.486)	1.182 (0.835, 1.673)	1.06 (0.798, 1.409)	1.146 (0.8, 1.643)
15–19	1.255 (0.895, 1.759)	1.627 (0.829, 3.192)	1.154 (0.81, 1.643)	1.542 (0.782, 3.041)
≥20	1.667 (1.185, 2.345)	4.238 (2.409, 7.455)	1.425 (1.004, 2.024)	3.71 (2.067, 6.66)

AUDIT = Alcohol Use Disorders Identification Test.

* Model 1 was adjusted for age.

† Model 2 was adjusted for age, body mass index, smoking, exercise, education level, and household income.

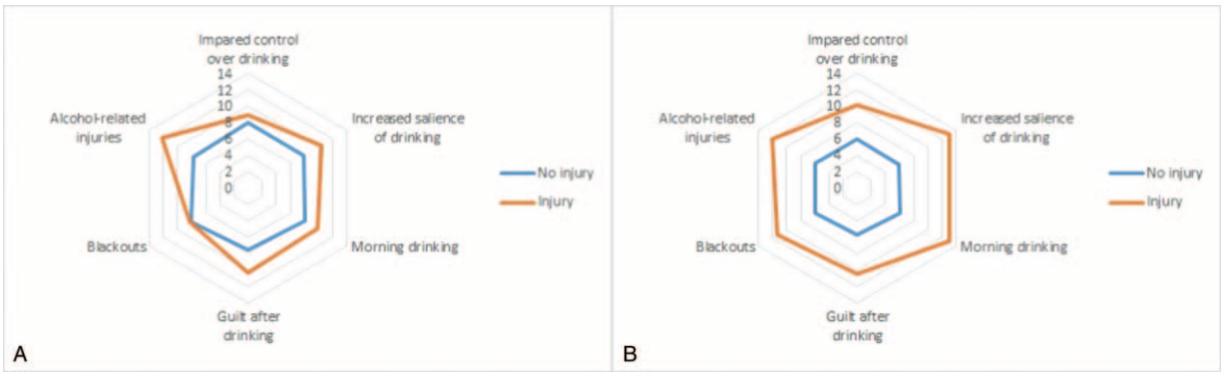

Figure 1. The monthly prevalence (%) of item contents of the Alcohol Use Disorders Identification Test domains according to experience of injury among men (A) and women (B). $P < 0.05$.

between alcohol and injury have focused on emergency department patients, this study is based on data from the KNHANES. The Korean drinking culture has been changing, as excessive drinking in women is rising in parallel to women's increased participation in social activities.

This study has several limitations. First, we were unable to evaluate the causal relationship between alcohol and the prevalence of injury due to the cross-sectional and retrospective design of the study. Second, self-reported alcohol intake and AUDIT scores may not have high validity due to recall and social desirability biases.[26,27] Third, excluding participants with missing values may lead to selection bias. Finally, women have a stronger interest in health issues than men,[28,29] which may contribute the decreased prevalence of injury in women.

Despite these limitations, this is the first epidemiologic study that examines the association between alcohol and injury in the Korean population using nationally representative data.

In conclusion, men with a high AUDIT level were more likely to experience injury, regardless of age, BMI, exercise, smoking, education, and income. In contrast, in women, both the AUDIT level and heavy and binge drinking were positively associated with the prevalence of injury. Given the multidimensionality of alcohol consumption and the multiplicity of variables related to injury, future prospective studies may identify drinking patterns and AUDIT level as predictors of injury among women.

References

[1] World Health OrganizationGlobal status report on alcohol and health—2014. World Health Organization, Geneva, Switzerland:2014.
[2] Lim SS, Vos T, Flaxman AD, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2012;380:2224–60.
[3] Rivara FP, Grossman DC, Cummings P. Injury prevention. First of two parts. N Engl J Med 1997;337:543–8.
[4] World Health OrganizationAlcohol and injury in emergency departments: summary of the report from the WHO Collaborative Study on Alcohol and Injuries. World Health Organization, Geneva, Switzerland: 2007.
[5] Cherpitel CJ, Ye Y, Bond J, et al. Relative risk of injury from acute alcohol consumption: modeling the dose-response relationship in emergency department data from 18 countries. Addiction 2015;110: 279–88.
[6] Brumback T, Cao D, King A. Effects of alcohol on psychomotor performance and perceived impairment in heavy binge social drinkers. Drug Alcohol Depend 2007;91:10–7.
[7] Nam GE, Cho KH, Park YG, et al. Socioeconomic status and dyslipidemia in Korean adults: the 2008–2010 Korea National Health and Nutrition Examination Survey. Prev Med 2013;57:304–9.
[8] Ammendola A, Gemini D, Iannaccone S, et al. Gender and peripheral neuropathy in chronic alcoholism: a clinical-electroneurographic study. Alcohol Alcohol 2000;35:368–71.
[9] Seo S, Chun S, Newell MA, et al. Association between alcohol consumption and Korean young women's bone health: a cross sectional study from the 2008 to 2011 Korea National Health and Nutrition Examination Survey. BMJ Open 2015;5:e007914.

[10] Reinert DF, Allen JP. The Alcohol Use Disorders Identification Test (AUDIT): a review of recent research. Alcohol Clin Exp Res 2002;26:272–9.
[11] Volk RJ, Steinbauer JR, Cantor SB, et al. The Alcohol Use Disorders Identification Test (AUDIT) as a screen for at-risk drinking in primary care patients of different racial/ethnic backgrounds. Addiction 1997;92: 197–206.
[12] Babor TF, Higgins-Biddle JC, Saunders JB, et al. AUDIT: The Alcohol Use Disorders Identification Test: guidelines for use in primary care. World Health Organization, Department of Mental Health and Substance Dependence, Geneva, Switzerland:2001.
[13] Grundy SM, Cleeman JI, Daniels SR, et al. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. Circulation 2005;112:2735–52.
[14] Cherpitel CJ. Focus on: the burden of alcohol use—trauma and emergency outcomes. Alcohol Res 2013;35:150–4.
[15] Chun S, Reid EA, Yun M. The association of alcohol drinking pattern and self-inflicted intentional injury in Korea: a cross-sectional WHO collaborative emergency room study. BMJ Open 2013;3:e002469.
[16] Yoonhee C, Jung K, Eo E, et al. The relationship between alcohol consumption and injury in ED trauma patients. Am J Emerg Med 2009;27:956–60.
[17] Li YM, Tsai SY, Hu SC, et al. Alcohol-related Injuries at an emergency department in Eastern Taiwan. J Formos Med Assoc 2006;105:481–8.
[18] Park B, Jung KW, Oh CM, et al. Factors associated with alcohol consumption in hepatitis B carriers: a nationwide study in the Republic of Korea. PLoS One 2014;9:e110144.
[19] Chun S, Reid EA, Sohn A, et al. Addiction research centres and the nurturing of creativity. The Korean Institute on Alcohol Problems (KIAP). Addiction 2013;108:675–9.
[20] Chun S, Welch ME, Shin M. Issues of Korean alcohol policy perspectives. Asian perspectives and evidence on health promotion and education 2011;Springer, Tokyo, Japan:326–339.
[21] Boyle A, Wee N, Harris R, et al. Alcohol-related emergency department attendances: is preloading a risk factor? Cross-sectional survey. Int J Emerg Med 2010;3:151–5.
[22] Hughes K, Anderson Z, Morleo M, et al. Alcohol, nightlife and violence: the relative contributions of drinking before and during nights out to negative health and criminal justice outcomes. Addiction 2008;103: 60–5.
[23] Graham K, Wilsnack R, Dawson D, et al. Should alcohol consumption measures be adjusted for gender differences? Addiction 1998;93: 1137–47.
[24] Pfefferbaum A, Rosenbloom M, Deshmukh A, et al. Sex differences in the effects of alcohol on brain structure. Am J Psychiatry 2001;158: 188–97.
[25] Schweinsburg BC, Alhassoon OM, Taylor MJ, et al. Effects of alcoholism and gender on brain metabolism. Am J Psychiatry 2003;160:1180–3.
[26] Park MB, Kim CB, Nam EW, et al. Does South Korea have hidden female smokers: discrepancies in smoking rates between self-reports and urinary cotinine level. BMC Womens Health 2014;14:156.
[27] Stockwell T, Donath S, Cooper-Stanbury M, et al. Under-reporting of alcohol consumption in household surveys: a comparison of quantity-frequency, graduated-frequency and recent recall. Addiction 2004;99: 1024–33.
[28] Barbeau EM, Krieger N, Soobader MJ. Working class matters: socioeconomic disadvantage, race/ethnicity, gender, and smoking in NHIS 2000. Am J Public Health 2004;94:269–78.
[29] Loucks EB, Rehkopf DH, Thurston RC, et al. Socioeconomic disparities in metabolic syndrome differ by gender: evidence from NHANES III. Ann Epidemiol 2007;17:19–26.