



Original Article

Gender Differences in Harmful Use of Alcohol Among Korean Adults



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ABSTRACT

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Objectives: Harmful alcohol consumption is associated with considerable social and economic damage to individuals and society. Because gender and ethnic background influence alcohol intake differently, examining gender specific factors influencing harmful drinking is necessary. This study investigated gender differences in alcohol consumption, harmful drinking, and the associated factors among Korean adults.

Methods: We analyzed the data from the 2012–2015 Korean National Health and Nutrition Examination Survey. Data from survey participants aged 20–64 years ($N = 18,581$) were included. The Alcohol Use Disorders Identification Test was used for alcohol dependence, and pooled weights were used. Chi-squared tests and multiple logistic regression analyses were conducted.

Results: The prevalence of harmful alcohol use (Alcohol Use Disorders Identification Test score ≥ 16) was 10.7% in the total sample; 18.4% in men and 3.4% in women, which constituted a significant difference. Education, marital status, smoking, perceived stress, and depressive feeling were associated with harmful drinking in both genders. However, household income, occupation, and perceived health status were associated with harmful drinking only in men.

Conclusion: Since there are gender differences in harmful drinking and alcohol dependence, gender tailored prevention and intervention strategies for alcohol dependence are necessary including consideration of smoking, stress, and depressive feeling.

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Introduction

Harmful alcohol use is associated with unintentional and intentional injuries, liver diseases, cardiovascular diseases, and cancer, as well as with social problems (i.e., violent behaviors, fatal accidents) [1-3]. According to a World Health Organization (WHO) report, 5.1% of the global burden of disease and injury is due to alcohol consumption, and 5.9% of all deaths worldwide were attributable to alcohol consumption in 2012 [4].

Koreans drink more alcohol than people of other nationalities and Koreans aged 15 years and older consume on average 11.9 L

of pure alcohol per year compared with a global prevalence of 6.4 L in 2016 [4]. In addition, high-risk drinking is more prevalent in Korea (15.1%) compared with other countries [5]. In 2010, the alcohol-dependence rate in Korea was 4.7%, whereas the average for the Western Pacific Region was 2.3% according to the WHO [4].

There are significant gender differences in the prevalence of harmful alcohol use and the proportion of global deaths associated with alcohol. It was reported in 2012 that 7.6% of deaths in men and 4.0% in women were attributable to alcohol [4]. Alcohol consumption levels differ by gender [6,7]. It has

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been reported that between 2012 and 2014 men drank more than women among non-Hispanic White, Mexican, other Latino, Asian, and other non-Hispanic participants [8]. Major gender differences are present in multiple alcohol-related outcomes such as alcohol consumption amount, age of beginning drinking, and alcohol-related death rates [9]. However, a study among the Hispanic population reported no gender differences in alcohol consumption during the past month (25.2% of women and 23.8% of men), nor in heavy drinking during the past 2 weeks (19.0% of women and 19.9% of men) [10].

In a study, male adolescents' drinking was associated with a higher level of social and enhancement motives, whereas that of female adolescents was associated with a higher level of coping motives and a lower level of conformity motives [11]. It was reported that male Korean college students drank to cope with stress, whereas females drank for enhancement motives however, both motives led to alcohol-related problems [12]. Moreover, gender differences in alcohol consumption are reportedly due to cultural differences and different biological and cultural needs [13].

According to findings reported by the WHO, the ratio of male to female heavy drinkers in South-East Asia was 10 to 9, and in the Western Pacific was 7 to 3, respectively [4]. In Korea, the prevalence of harmful alcohol use was 5-fold higher in men than women (2.5% in men and 0.5% in women) [4] and the rate of high-risk drinking in men was 23.7%, and in women was 4.2% [5]. The alcohol-dependence rate in Korea has been reported to be 7.8% in men and 1.7% in women [4]. However, few studies have investigated the factors associated with these gender differences. Therefore, in this current study gender differences in harmful alcohol use were evaluated and the factors associated with this phenomenon in Korea were examined.

Materials and Methods

1. Design and participants

This study was a secondary analysis of the 2012–2015 Korean National Health and Nutrition Examination Survey (KNHANES), which was a complex, stratified, multi-stage cluster probability sampling method survey. The primary sample units (PSUs), consisted of 50-60 households per each PSU, which were selected from a census block or residential condition. Twenty households out of the selected PSUs were selected for the field survey. All members (> 1 year) in the selected households were asked to participate in the KNHANES. Approximately 10,000 people were selected in total between 2012 to 2015 from 192 PSUs [14]. The response rate was 80.0%, 79.3%, 77.8%, and 77.6% in 2012, 2013, 2014, and 2015, respectively [15-18]. To ensure representative sampling for an equal sampling

probability, weighted values were assigned to each respondent. A standardized interview, health examination, and nutrition survey were used to collect data. Data from adults aged 20–64 years ($N = 13,709$) were used and analyzed in this study (JJNU-IRB-2018-055).

2. Measures

The Korean version of the Alcohol Use Disorders Identification Test (AUDIT-K) was used to assess harmful alcohol use. The AUDIT-K was based on the percentage of alcohol by volume in Korean liquor, and has been verified in the Korean population [19]. The AUDIT-K consists of 10 items scored on a 5-point Likert scale, ranging from 0 to 4 points. Higher scores indicate an increased likelihood of hazardous and harmful patterns of alcohol consumption. Reliability of the AUDIT-K was determined by Cronbach's alpha that was 0.89 in the study by Kim et al [20] and 0.89 in this study. Validity of the AUDIT-K was shown to be high in several studies [20-22]. The cut-off for harmful alcohol use was an AUDIT-K score ≥ 16 in this current study.

Sociodemographic characteristics and health-related behavioral variables were included in the analysis of this study as "factors associated with harmful alcohol use." The sociodemographic characteristics were age (20-44 years, 45-64 years), household income (low, low-intermediate, intermediate-high, and high), educational level (elementary, middle school, high school, university), occupation (professional/manager, office worker, sales/service, physical worker, none), and marital status (unmarried, married, separated/divorced). The health-related behavioral variables were perceived health status, currently smoking, physically active (walking for 30 minutes daily), perceived stress, and experience of depressive feeling (feeling of sadness or despair that negatively affects daily life). To evaluate subjects' perceived health status they were asked, "In general, how would you rate your health?" and the answer was categorized into "good (excellent/good)," "moderate (fair)" or "poor (poor/very poor)." Perceived stress was measured with the question, "How do you feel stressed on an ordinary day?" and was dichotomized into "a lot / very stressed" and "a little." A single question was used to assess the experience of depressive feelings, "In the last year have you ever felt sad or depressed enough for it to affect your daily life most days for 2 weeks or longer?" with a dichotomous response of "yes," or "no."

3. Statistical analysis

The data were analyzed using SAS (version 9.4) software, where $p < 0.05$ was considered to be indicative of statistical significance. Pooled weights were used in the statistical analysis. Chi-square tests and multiple logistic regression

analyses were conducted to explore the association between each factor and harmful alcohol use.

Results

In terms of age, 57.2% of men and 54.7% of women were 20–44 years, and 33.2% of men and 35.8% of women had a low or low–intermediate household income. Of the men and women, 85.5% and 78.7% respectively, had a high school education or above. Additionally, 19% and 44.4% of the men and women respectively were unemployed, 30.7% and 19.5% respectively, were unmarried, and 37.9% and 29.9% respectively, perceived their health to be good. Moreover, 43.4% and 6.2% of the men and women respectively, were currently smoking,

and 41.1% and 37.7% respectively, reported walking daily for at least 30 minutes. Among the men and women, 26.6% and 28.9% respectively, reported being very stressed, and 8.3% and 15.1% respectively, stated that they felt depressed. There were significant differences between men and women in age ($\chi^2 = 8.40$, $p = 0.006$), educational level ($\chi^2 = 110.75$, $p < 0.001$), occupation ($\chi^2 = 1,323.81$, $p < 0.001$), marital status ($\chi^2 = 285.26$, $p < 0.001$), perceived health status ($\chi^2 = 113.75$, $p < 0.001$), currently smoking ($\chi^2 = 2,587.58$, $p < 0.001$), walking ($\chi^2 = 15.67$, $p = 0.001$), stress ($\chi^2 = 9.06$, $p = 0.014$), and depressive feeling ($\chi^2 = 136.10$, $p < 0.001$; Table 1).

The prevalence of harmful alcohol use (AUDIT-K score ≥ 16) was 10.7% in Korean adults aged 20–64 years (18.4% in men and 3.4% in women). Among men, harmful alcohol use was more prevalent in those aged 45–64 years (21.5%) compared

Table 1. Sociodemographic characteristics between elderly Koreans with and without activity limitation.

Parameters (or variables)	Gender						Chi	p	
	Male			Female					
	N	%	SE	N	%	SE			
Age group (y)	20–44	2,702	57.2	0.8	3,984	54.7	0.7	8.40	0.006
	45–64	2,780	42.8	0.8	4,243	45.3	0.7		
Income	Low	1,336	25.8	0.9	1,997	25.3	0.7	1.46	0.718
	Low-intermediate	1,393	25.8	0.8	2,039	25.4	0.6		
	Intermediate-high	1,341	24.5	0.7	2,063	24.6	0.6		
	High	1,371	23.9	0.9	2,080	24.7	0.8		
Household income	Low	507	9.4	0.5	842	9.7	0.5	10.41	0.020
	Low-intermediate	1,277	23.8	0.8	2,115	26.1	0.7		
	Intermediate-high	1,702	32.3	0.9	2,477	31.0	0.7		
	High	1,955	34.5	1.0	2,745	33.2	0.9		
Education	Elementary	453	6.8	0.4	1,138	11.3	0.4	110.75	< 0.001
	Middle school	476	7.7	0.4	870	10.0	0.4		
	High school	2,111	43.2	0.8	3,054	40.4	0.7		
	University	2,270	42.3	0.9	2,969	38.3	0.8		
Profession	Professional/manager	1,055	19.8	0.7	1,132	14.7	0.5	1323.81	< 0.001
	Office worker	753	13.5	0.5	755	10.0	0.4		
	Sales/service	686	13.5	0.6	1,310	16.7	0.5		
	Physical worker	1,877	34.1	0.9	1,241	14.2	0.5		
	None	914	19.0	0.7	3,591	44.4	0.7		
Marital status	Unmarried	1,268	30.7	0.9	1,255	19.5	0.6	285.26	< 0.001
	Married	3,955	64.8	0.9	6,168	71.9	0.7		
	Separated/divorced	254	4.5	0.3	794	8.6	0.4		

Table 1. (Continued).

Parameters (or variables)		Gender						Chi	p
		Male			Female				
		N	%	SE	N	%	SE		
Living	Alone	349	6.9	0.5	417	4.5	0.3	39.06	< 0.001
	With others	5,133	93.1	0.5	7,810	95.5	0.3		
Perceived health status	Good	1,976	37.9	0.8	2,384	29.9	0.6	113.75	< 0.001
	Moderate	2,656	49.4	0.8	4,276	53.0	0.7		
	Poor	689	12.7	0.5	1,388	17.1	0.5		
Economic activity	No	914	18.9	0.7	3,591	44.3	0.7	987.30	< 0.001
	Yes	4,397	81.1	0.7	4,446	55.7	0.7		
Currently smoking	No	3,175	56.6	0.8	7,792	93.8	0.3	2587.58	< 0.001
	Yes	2,305	43.4	0.8	433	6.2	0.3		
Strenuous physical activity	No	2,758	80.2	0.8	4,127	86.5	0.6	57.06	< 0.001
	Yes	637	19.8	0.8	636	13.5	0.6		
Moderate physical activity	No	3,125	91.4	0.6	4,518	94.9	0.4	38.03	< 0.001
	Yes	270	8.6	0.6	244	5.1	0.4		
Walking (> 30 m/d)	No	3,187	58.9	0.9	5,056	62.3	0.7	15.67	0.001
	Yes	2,119	41.1	0.97	2,978	37.7	0.7		
Obesity (BMI)	< 18.5	121	2.6	0.3	506	7.3	0.4	397.43	< 0.001
	≤ 18.5, < 25	3,183	58.2	0.7	5,529	67.2	0.6		
	≤ 25	2,167	39.3	0.7	2,182	25.5	0.6		
Stress	Little	4,082	73.4	0.7	5,985	71.1	0.6	9.06	0.014
	A lot	1,398	26.6	0.7	2,241	28.9	0.6		
Experience of depressive feeling (over 2 wks)	No	4,676	91.7	0.5	5,959	84.9	0.5	136.10	< 0.001
	Yes	422	8.3	0.5	1,043	15.1	0.5		
Suicide ideation	No	4,831	94.9	0.4	6,395	91.2	0.4	62.71	< 0.001
	Yes	268	5.1	0.4	607	8.8	0.4		

BMI = body mass index; SE = standard error.

with 20–44 years (16.1%). However, among women harmful alcohol use was more prevalent in those aged 20–44 years (4.8%) compared with 45–64 years (1.6%). Harmful alcohol use was more prevalent in men with a high household income than in those with a low household income (20.4% and 14.8% respectively) and in those with an elementary-school education (23.5%). In contrast, in women harmful alcohol use was the most prevalent in high-school graduates (4.6%). In terms of occupation, manual laborers showed the highest rate of harmful alcohol use among men (22.2%), and for women it was sales/service workers (6.0%). A higher prevalence of harmful alcohol use was identified among men who were separated or

divorced (26.0%), whereas this was true for unmarried women (6.8%). The frequency of harmful alcohol use was higher among those with a moderate health status, than among those who had a good health status among both men and women (19.1% of men and 2.9% of women). The frequency of harmful alcohol use in both men and women was higher among the currently smoking group, than among the non-smoking group (25.2% of men and 17.3% of women). Among men, the prevalence of harmful alcohol use was higher in those who did not walk for more > 30 minutes daily (19.7%) compared with those who did (16.7%). The prevalence of harmful alcohol use was higher in those who reported being stressed (25.4% in men and 6.3% in

women) or experienced depressive feeling (29.8% in men and 10.2% in women; Table 2).

The prevalence of harmful alcohol use in both genders differed significantly by age, educational level, occupation, marital status, perceived health status, currently smoking, perceived stress, and the presence/absence of depressive feeling. Additionally, household income was associated with harmful alcohol use in men (Table 2).

The factors associated with harmful alcohol use differed by gender. In men, high household income, elementary school education, men who were divorced or separated, manual

laborers, moderate health status, currently smoking, perceived stress, and depressive feeling were significantly associated with harmful alcohol use. In women, education to high school graduate level, sales/service workers, unmarried women, currently smoking, a moderate health status, perceived stress, and depression status were significantly associated with harmful alcohol use. The odds ratio (OR) for harmful alcohol use was highest for the currently smoking group in both men and women. The impact of currently smoking on harmful alcohol use was greater in women than in men. In men, high ORs indicated that household income, perceived stress,

Table 2. Association between problematic alcohol drinking and socio-demographic characteristics, health status, health behaviors, and mental health by gender.

Variables	Gender								
	Male				Female				
	%	SE	Chi	<i>p</i>	%	SE	Chi	<i>p</i>	
Total									
Age group (y)	20-44	16.1	0.8	25.24	< 0.001	4.8	0.4	61.59	< 0.001
	45-64	21.5	0.9			1.6	0.3		
Income	Low	17.5	1.2	5.82	0.234	3.6	0.5	3.68	0.478
	Low-intermediate	17.1	1.1			3.8	0.5		
	Intermediate-high	19.1	1.3			3.1	0.4		
	High	20.2	1.3			2.9	0.5		
Household income	Low	14.8	1.7	10.61	0.035	3.9	0.8	2.68	0.605
	Low-intermediate	18.5	1.2			3.1	0.5		
	Intermediate-high	17.4	1.1			3.7	0.5		
	High	20.4	1.0			3.0	0.4		
Education	Elementary	23.5	2.4	26.80	< 0.001	2.0	0.5	31.77	< 0.001
	Middle school	22.7	2.3			2.0	0.6		
	High school	19.7	0.9			4.6	0.5		
	University	15.5	0.9			2.6	0.4		
Profession	Professional/manager	15.5	1.2	57.32	< 0.001	2.8	0.6	42.78	< 0.001
	Office worker	21.3	1.8			3.6	0.8		
	Sales/service	19.9	1.9			6.0	0.8		
	Physical worker	22.2	1.1			1.8	0.5		
	None	11.7	1.2			2.8	0.3		
Marital status	Unmarried	12.5	1.1	60.72	< 0.001	6.8	0.8	81.61	< 0.001
	Married	20.7	0.8			2.3	0.3		
	Separated/divorced	26.0	3.2			4.3	0.9		
Living	Alone	19.7	2.6	0.48	0.587	5.8	1.4	7.13	0.019
	With others	18.3	0.6			3.2	0.3		

Table 2. (Continued).

Variables		Gender							
		Male				Female			
		%	SE	Chi	<i>p</i>	%	SE	Chi	<i>p</i>
Perceived health status	Good	15.0	0.9	44.80	< 0.001	2.6	0.4	30.29	< 0.001
	Moderate	19.1	0.8			2.9	0.3		
	Poor	26.3	1.9			5.7	0.8		
Economic activity	No	11.7	1.2	36.58	< 0.001	2.8	0.3	4.50	0.085
	Yes	20.0	0.7			3.7	0.4		
Currently smoking	No	13.2	0.7	130.26	< 0.001	2.4	0.2	322.73	< 0.001
	Yes	25.2	1.0			17.3	2.2		
Strenuous physical activity	No	20.3	0.8	1.04	0.379	3.3	0.4	8.29	0.015
	Yes	18.6	1.8			5.6	1.1		
Moderate physical activity	No	20.2	0.8	0.80	0.427	3.5	0.4	1.01	0.417
	Yes	18.0	2.5			4.8	1.8		
Walking (> 30 m/d)	No	19.7	0.8	7.7	0.020	3.5	0.3	1.17	0.388
	Yes	16.7	0.9			3.0	0.4		
Obesity (BMI)	< 18.5	6.7	2.3	20.6	< 0.001	3.4	0.8	0.07	0.978
	≤ 18.5, < 25	17.5	0.8			3.4	0.3		
	≤ 25	20.5	1.0			3.3	0.5		
Sleep (h)	< 6	21.7	1.9	7.36	0.130	4.2	0.8	14.43	0.028
	6	18.4	1.0			3.3	0.5		
	7-8	17.5	0.8			2.9	0.3		
	> 9	21.0	2.8			5.4	1.2		
Stress	Little	15.9	0.6	64.38	< 0.001	2.2	0.3	87.24	< 0.001
	A lot	25.4	1.3			6.3	0.7		
Experience of depressive feeling (over 2 wks)	No	19.0	0.6	28.44	< 0.001	2.8	0.3	129.22	< 0.001
	Yes	29.8	2.5			10.2	1.1		
Suicide ideation	No	19.1	0.6	32.3	< 0.001	3.3	0.3	78.56	< 0.001
	Yes	33.5	3.3			10.6	1.6		

BMI = body mass index; SE = standard error.

and depressive feeling were risk factors for harmful alcohol consumption, whereas depressive feeling, marital status, and educational level were considered as the greatest risks in women (Table 3).

A higher prevalence of harmful alcohol use was observed in men with a high household income, than in those with a low household income (OR = 1.69, $p < 0.001$). A higher prevalence of harmful alcohol use among men was observed with an elementary-school education compared with college graduates

(OR = 1.54, $p = 0.006$), high-school (OR = 1.47, $p < 0.001$) and middle-school (OR = 1.44, $p = 0.023$) education. Compared with married men, a significantly lower prevalence of harmful alcohol use was observed in unmarried men (OR = 0.61, $p < 0.001$). There was a significantly lower prevalence of harmful alcohol use among unemployed men, than among those with professional or managerial occupations (OR = 0.65, $p = 0.009$). There was also a higher prevalence of harmful alcohol use among men who perceived their health to be poor, than among those

who perceived their health to be good (OR = 1.46, $p = 0.005$). A higher prevalence of harmful alcohol use was observed in those who currently smoke, than in non-smokers (OR = 1.99, $p < 0.001$). Harmful alcohol use was more prevalent among men who felt stressed, than among those who did not (OR = 1.59, $p < 0.001$). Additionally, there was a higher prevalence of harmful alcohol use among men who had felt depressed for 2 weeks, than among men who did not feel depressed (OR = 1.53, $p = 0.001$; Table 3).

A significantly higher prevalence of harmful alcohol use was

identified in women with a high-school education, than in those with a college education (OR = 1.78, $p = 0.001$). Unlike the case for men, a higher prevalence of harmful alcohol use was observed among unmarried women, than among married women (OR = 2.6, $p < 0.001$). There was also a significantly higher prevalence of harmful alcohol use among females currently smoking, than among female non-smokers (OR = 5.37, $p < 0.001$). This was also the case for women who felt stressed compared with those who did not (OR = 1.63, $p < 0.001$), and for women who felt depressed over 2 weeks compared with

Table 3. The predictive factors for problematic alcohol drinking by gender.

Variables (reference)		OR	95% CI		<i>p</i>
Male					
Household income (low)	Low-intermediate	1.25	0.97	1.62	0.091
	Intermediate-high	1.30	0.99	1.70	0.055
	High	1.69	1.29	2.21	< 0.001
Education (university)	Elementary	1.54	1.13	2.09	< 0.001
	Middle school	1.44	1.05	1.96	0.023
	High school	1.47	1.20	1.79	< 0.001
Marital status (married)	Unmarried	0.61	0.49	0.76	< 0.001
	Separated/divorced	1.18	0.85	1.63	0.332
Profession (professional/manager)	Office worker	1.29	0.96	1.72	0.091
	Sales/service	1.13	0.81	1.56	0.468
	Physical worker	1.14	0.87	1.50	0.342
	None	0.65	0.47	0.90	0.009
Perceived health status (good)	Moderate	1.14	0.96	1.36	0.147
	Poor	1.46	1.12	1.90	0.005
Currently smoking (no)	Yes	1.99	1.70	2.34	<0.001
Stress (little)	A lot	1.59	1.32	1.90	< 0.001
Experience of depressive feeling (over 2 wks)		1.53	1.19	1.97	0.001
Female					
Education (university)	Elementary	0.87	0.48	1.58	0.649
	Middle school	0.79	0.42	1.48	0.455
	High school	1.78	1.25	2.53	0.001
Marital status (married)	Unmarried	2.61	1.85	3.67	< 0.001
	Separated/divorced	1.21	0.71	2.07	0.482
Currently smoking (no)	Yes	5.37	3.68	7.82	< 0.001
Stress (little)	A lot	1.63	1.13	2.35	0.001
Experience of depressive feeling (over 2 wks)		2.90	2.08	4.04	< 0.001

CI = confidence interval; OR = odds ratio.

those who did not (OR = 2.9, $p < 0.001$; Table 3).

Discussion

In this study, currently smoking was strongly associated with harmful alcohol use in both genders. Similarly, smokers had a 2-fold higher frequency of heavy drinking, than non-smokers among men, and a 3-fold higher frequency of heavy drinking among women [23]. It was also reported that among women, the prevalence of harmful alcohol use was 4.93-fold higher in smokers, than in non-smokers, whereas the prevalence among men was 3.57-fold higher in smokers, than in non-smokers [24]. The prevalence of smoking in men was 5 times higher than women due to the lower social acceptability of women's smoking in Korea [25]. This may imply that female smokers may have relatively higher stress or depressive feelings that lead to smoking, than male smokers. Considering that smoking is statistically positively associated with drinking [23,26] female smokers may have a greater inclination toward harmful alcohol use than male smokers. There was a higher prevalence of heavy drinking and problem alcohol use among ex-smokers of both genders [23,24]. There was also a high prevalence of smoking among individuals engaged in harmful alcohol use [26]. Thus, harmful alcohol use and smoking are interrelated. Therefore, smoking cessation interventions should be part of the intervention strategies to ameliorate problematic alcohol consumption, particularly for women.

Depressive feelings were associated with harmful alcohol use by both genders in this study and this is consistent with several previous reports [27-29]. Moreover, there was a 2-fold higher prevalence of depressive feelings among Korean women (15.1%), than among Korean men (8.3%). A diagnostic assessment of depression was not included in this study but this finding indicates that a subjectively experienced depressive mood is related to harmful alcohol use. The effect of depressive feelings on harmful alcohol use was greater in women than in men. This finding is similar to a previous study reporting that women with depression had a higher rate of harmful drinking than men with depression [30]. This indicates that women with depression may be more dependent on alcohol than men with depression but, there is no clear cause of the gender difference. However, Korean women with depressive feelings have a lack of resources to relieve stress compared with Korean men in society (a robust study is necessary to investigate the possible causes of the gender differences).

Strategies to prevent or manage harmful alcohol use should consider the possibility of depression. People with alcohol dependence were reported to be at a higher risk of major depressive episodes [31]. Therefore, depressive feelings and harmful alcohol use are interrelated. However, the cross-

sectional design of this study prevented causal inferences being drawn.

A high level of stress increased the risk of harmful alcohol use in both men and women (OR = 1.59 and 1.63, respectively). However, it was reported that stress levels did not significantly increase the risk of harmful alcohol use in women or men [24]. In this study harmful alcohol use was met when there was an AUDIT-K score of ≥ 16 , whereas an AUDIT-K score of ≥ 12 was used in the study by Jeon and Lee in 2010 [24], suggesting that the threshold was set too high. Stress is significantly associated with the frequency of alcohol intake and heavy drinking [23]. That is, stress is not significantly related to low-level alcohol intake, but is significantly associated with heavy drinking or harmful alcohol use. Therefore, stress management should reduce the risk of harmful alcohol use in both genders.

Consistent with the findings of a previous study [24], there was a higher prevalence of harmful alcohol use among men with an elementary-school education and women with a high-school education, than among those with a college education. However, a previous study showed that a higher level of education was significantly associated with harmful alcohol use regardless of gender [32]. Discrepancies among reports may be due to the population differences, as shown in a study conducted in Korean adults [24] and another with older Swedish adults [32]. The finding in this current study are consistent with a previous study among the Korean adult population. However, further studies are needed to investigate the differences between countries and populations. It was reported that single, separated, or divorced men showed a greater risk of harmful alcohol use [33]. Another study observed a lower prevalence of harmful alcohol use among unmarried men however, a higher prevalence was reported among unmarried compared with married, women [14]. They also reported that unmarried women had a higher risk of harmful alcohol use compared with married women, but no significant relationship with marital status was reported in men [23]. A previous study, reported that married individuals of both genders had a significantly lower risk of harmful alcohol use, compared with unmarried, divorced, separated, or widowed individuals [24]. These findings may be associated with stress due to problematic spousal relationships [34].

In men, but not in women, household income, perceived health status, and occupation were associated with harmful alcohol use. Household income was significantly positively related to alcohol consumption in men, but not in women. Additionally, unemployed men had a lower risk of harmful alcohol use than men with a professional occupation. It was reported that men with a low household income had a lower risk of harmful alcohol use compared with those with a high household income [24]. The differences between men and women may be due to gender differences in economic

activities, job classifications, and income levels. A significantly lower prevalence of harmful alcohol use among unemployed men was observed in the current study, but employment status was not associated with harmful alcohol use in women. Another study observed that employment increased the frequency of harmful alcohol use among men but not women [35]. Unemployed people (i.e., those who lost a job or retired) may have fewer opportunities to participate in social gatherings (i.e., drinking with coworkers after work) and less disposable income. Alcohol consumption plays an important role in nonverbal communication in Korea, as people tend to socialize while drinking [36]. Korean workers often drink with coworkers after work to relieve stress, relax, or network [37]. It was reported in 2018 that men (69.4%) are more likely than women to be the major source of household income (30.6%) [38]. Moreover, as of July 2018, 74.1% of men ≥ 15 years of age were economically active compared with 53.5% of women [38]. In this current study, 81% of men were employed, whereas 55.6% of women were employed. This may explain why household income and employment status were significantly associated with harmful alcohol use in men but not in women.

A previous study showed that household income was not significantly associated with heavy drinking [23]. In contrast, several studies have demonstrated an association between low income and harmful alcohol use [39–44]. It was also reported that people with a middle-class household income were more likely to report harmful alcohol use [45]. Previous studies of the relationship between household income and harmful alcohol use were conducted in low-to-middle income countries (e.g., India, Zimbabwe, Nepal, and Thailand), whereas this study was conducted in Korea, a high-income country. A study of high household income in Chile and Finland, both high-income countries, reported a higher prevalence of alcohol consumption and harmful alcohol use [46]. Thus, the association between harmful alcohol use and household income may differ according to the economic level of the nation in question. Further studies should explore the factors that influence the relationship between household income and harmful alcohol use.

A poor self-rated health status was associated with a higher prevalence of harmful alcohol use in men but not in women. Several studies have shown that harmful alcohol use is significantly associated with perceived health status [47–49], but these studies did not assess gender differences. Perceived health status and harmful alcohol use may also be related to gender differences, derived from more frequent drinking among men than among women, as the adverse effects of this behavior may reduce self-perceived health status. Therefore, an improved perceived health status may reduce the risk of harmful alcohol use among men.

The findings of this current study provide insight into gender

differences in the prevalence of, and the factors associated with, harmful alcohol use among Korean adults. However, this study had limitations. Firstly, the cross-sectional design of this study prevented investigation into the causal associations of smoking, depression, stress, and perceived health status with harmful alcohol use. Indeed, harmful alcohol use may have influenced the observations related to these factors. Secondly, the mechanisms underlying the gender differences observed in this study were not investigated.

Conclusion

Information on gender differences affecting harmful alcohol consumption and associated factors, will enable identification of subgroups vulnerable to harmful alcohol use, and aid in the development of management or prevention strategies for harmful alcohol consumption. In this study gender differences were observed in the prevalence of harmful alcohol use and its associated factors. The demographic factors related to harmful alcohol use (i.e., education, marital status, household income, occupation, and perceived health status) should be considered when identifying the target groups for programs that are designed to prevent and/or treat harmful alcohol use. Moreover, such programs should also address smoking, stress, and depression.

Conflicts of Interest

The authors have declared that no conflicts of interest exist.

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