Original Article

Association between perceived stress, alcohol consumption levels and obesity in Koreans

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Background and Objectives: Coping with stress often leads to unhealthy behaviors that can have an impact on the development of obesity. Therefore, this study is investigate the effect of perceived stress level on alcohol consumption habits, as well as the effect of the interaction between alcohol consumption habits and stress level on obesity in Koreans. **Methods and Study Design:** We analyzed perceived stress, alcohol consumption habits (alcohol consumption status, quantity, and alcohol use disorders identification test) and the anthropometrics of 6,229 subjects from the Korean National Health and Nutrition Examination Survey. The gender-based differences of the effect of the perceived level of stress on alcohol consumption habits and anthropometric measurements, as well as the interaction of the perceived level of stress and alcohol consumption habits on prevalence or ORs of obesity were analyzed. **Results:** The subjects with high perceived stress showed higher proportions for unhealthy alcohol consumption habits than those with low perceived stress [ORs (95% CIs)=1.35 (1.19-1.54), 1.95 (1.68-2.26), and 1.87 (1.60-2.19) for alcohol consumption status, alcohol consumption quantity, and alcohol use disorders identification test, respectively]. Men showed significant interactions between the perceived stress and all alcohol consumption habits with respect to obesity [ORs (95% CIs)=1.28 (1.06-1.55), 1.81 (1.52-2.16), and 1.40 (1.17-1.68) for alcohol consumption status, alcohol consumption quantity, and alcohol use disorders identification test, respectively]. Among women, interactions between the perceived stress and alcohol consumption status [ORs (95% CIs)=0.70 (0.60-0.83)] and alcohol consumption quantity [ORs (95% CIs)=0.93 (0.54-1.36)] in relation to obesity were found to be significant. **Conclusion:** Our study demonstrated that the perceived stress influenced alcohol consumption habits that may have impacted obesity.

Key Words: alcohol consumption habits, BMI, Korean National Health and Nutrition Examination Survey, obesity, perceived stress

INTRODUCTION

Stress is a physiological response to demanding external stimuli that can result in feelings of danger and anxiety and could be defined as a risk factor for individual harm.[1] Stress is one of the greatest pressures on individuals in modern society.[2]

There have been studies about the association between chronic stress and various diseases, but these studies have produced inconsistent results. However, systematic reviews and meta-analyses of these prospective studies showed that excess stress is strongly related to serious physical diseases such as the incidence rate of type 2 diabetes,[3] the morbidity rate of cancer[4] as well as the main predictors of cardiovascular disease and stroke.[5,6] Additionally, many studies reported that chronic stress was correlated with increased abdominal adiposity.[7-10] A meta-analysis of 14 cohorts that studied psychosocial stress and objective measurements adiposity found that stress was a key factor involved in increased adiposity.[7] Furthermore, Mouchacca et al reported that subjects with higher levels of perceived stress showed a higher BMI and increased odds of being obese in a cohort of 1,382 Australian women.[8]

The response to stress is often accompanied by risky behaviors, such as smoking, alcohol consumption, and overeating.[11] In a survey with 1,000 samples in South Korea, subjects with extremely high stress were 3 times more seriously alcohol dependent than those with high stress, and subjects with higher levels of stress demonstrated greater consumption of alcohol.[12] Moderate consumption of alcohol is a common means to relieve stress;

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however, these behaviors may result in increased consumption of alcohol if the perceived stress becomes even greater.[13]

Drinking habits have been identified as an important health factor.[14] A study about the relationship between obesity and the quantity of alcohol consumed showed that moderate alcohol consumption did not affect body weight, but heavy alcohol consumption could increase the odds of being obese; however, this effect may be influenced by gender.[15] Shelto et al suggested that habitual alcohol consumption may be as major factor underlying the rise in obesity; alcohol-derived calorie consumption increased the recommended daily caloric intake in men and women by an additional 27% and 19%, respectively.[16]

Systematic scientific research on stress management is needed to help properly manage stress as it is a critical factor for psychological and physical health. The study of the association between stress and obesity together with their health-related causality should be conducted and discussed. Therefore, we aim to evaluate the association of alcohol consumption habits with the mental aspects of perceived level of stress using the Korean National Health and Nutrition Examination Survey (KNHANES). We also investigated the interaction between alcohol consumption habits and the perceived level of stress in relation to obesity.

SUBJECTS AND METHODS

Subjects

Our analysis was based on the data from the third year (2012) of the 5th KNHANES-V. The KNHANES was performed as a cross-sectional survey to investigate the health and nutritional status of the Korean population by the Division of Chronic Disease Surveillance under the Korea Centers for Disease Control and Prevention (KCDC). The survey consists of a health interview, a health examination, and a nutrition questionnaire survey. Among the 8,057 subjects in the KNHANES, 6,229 subjects (2,637 men and 3,592 women) aged over 20 years were selected for this study. All of the subjects in this survey signed an informed consent form. The survey study protocol was approved by the Institutional Review Board of the KCDC.

Data collection

The subjects' perceived levels of stress and alcohol consumption habits were collected using the KNHANES. Body weight and height were measured by direct measurement during a health examination. All data were self-reported with the exception of a health examination.

At the health interview, subjects responded to the questionnaire about their usual perceived level of stress. The high stress (HS) group was defined as "very often feel stress", or "fairly often feel stress", and the low stress (LS) group was defined as "almost never feel stress" or "never feel stress".

Alcohol consumption habits were based on the alcohol consumption status, the usual quantity of alcohol beverages consumed, and the alcohol use disorders identification test (AUDIT) score.[17] The alcohol consumption status was divided into 'non-drinking', with less than 1 cup per month, and 'drinking', with over 1 cup per month in the past year. The usual alcohol consumption quantity which was the average drinking quantity without regard to type of alcohol was classified as '1-2 cups', '3-4 cups', '5-6 cups', and 'over 7 cups'. The AUDIT consists of 10 simple questions with a total possible score of 40. By the WHO criterion,[18] a score of less than 7 is indicated as 'Low risk drinking', a score of 8-15 is associated with 'Hazardous drinking', a score of 16-19 as 'Harmful drinking', and a score of over 20 as 'Alcohol dependence'.

BMI was calculated by dividing the weight in kilograms by the height in meters squared. Obesity was defined as BMI $\geq$25 kg/m^2, which was based on the WHO Asia-Pacific Area criterion for obesity.[19]

Statistical analysis

All statistical analyses were performed using SPSS for Windows (version 21.0; IBM Corporation, Armonk, NY, USA) with a level of significance at $p<0.05$. First, the effect of gender on categorical variables was analyzed with the χ^2-test, and continuous variables were analyzed with Student's t-test. Second, to analyze with difference in alcohol consumption habits and anthropometrics according to the perceived level of stress, the alcohol consumption quantity was divided into 'non-drinking', 'less than 4 cups' including 1-2 cups and 3-4 cups, and 'over 5 cups' including 5-6 cups and 7 cups or more. The AUDIT score was divided into 'low risk drinking' with a score of less than 7, and 'hazardous drinking', 'harmful drinking', and 'alcohol dependence' which is score of over 8 by the WHO criterion. Third, the interaction of gender and the perceived level of stress or alcohol consumption habits on anthropometrics and BMI were detected with a two-way ANOVA. To examine the perceived level of stress or alcohol consumption habits on obesity prevalence after stratification by gender, the interaction term the ORs and 95% Cis were estimated with the Cochran-Mantel-Haenszel (CMH) test. The homogeneity tests of ORs estimated by gender were analyzed using the Breslow-Day test. Finally, ORs of obesity prevalence and 95% CIs were estimated using the CMH test. The homogeneity test for gender was analyzed by the Breslow-Day test to identify the effect of the interaction between alcohol consumption habits and the perceived level of stress on obesity prevalence by gender.

RESULTS

General characteristics

The anthropometrics, perceived level of stress and alcohol consumption habits of 6,229 subjects classified by gender are listed in Table 1. Significant differences in height, weight, BMI, and obesity prevalence were observed by gender. Subjects with the high perceived level of stress were greater in women than in men ($p<0.001$). The number of non-drinking subjects was higher for women than for men; however, subjects who consumed over 7 cups of alcohol were greater in men than in women ($p<0.001$). The average AUDIT score was approximately 2.5 times higher in men than in women ($p<0.001$). When the AUDIT score was classified by the WHO Criterion, the number of 'low risk' subjects (score of less than 7) was lower for men than for women; however, the numbers of subjects with 'alcohol dependence', 'hazardous

Table 1. Basic characteristics

		Men (n=2,637)	Women (n=3,592)	*p*-value*
Height (cm)		169±6.65	156±6.84	<0.001
Weight (kg)		69.2±11.17	57.4±9.46	<0.001
BMI (kg/m^2)		24.0±3.16	23.5±3.59	<0.001
Obesity prevalence†		846 (34.2)	1,047 (30.4)	<0.001
Stress level	Low	1,797 (78.6)	2,329 (71.8)	<0.001
	High	488 (21.4)	913 (28.2)	
Alcohol quantity (cups)	Non drinking	776 (29.4)	1,622 (45.2)	<0.001
	1-2	416 (15.8)	1,130 (31.5)	
	3-4	403 (15.3)	443 (12.3)	
	5-6	358 (13.6)	205 (5.7)	
	≥7	684 (25.9)	192 (5.3)	
AUDIT score		8.60±7.19	3.38±4.55	<0.001
AUDIT‡	Low risk (≤7)	1,107 (51.1)	2,232 (87.2)	<0.001
	Hazardous (8-15)	658 (30.4)	247 (9.6)	
	Harmful (16-19)	204 (9.4)	42 (1.6)	
	Alcohol dependence (≥20)	196 (9.1)	39 (1.5)	

AUDIT: alcohol use disorders identification test.
Data was represented mean±SD or n (%).
*p-values were calculated using t-test or x^2-test.
†Obesity was defined as body mass index ≥25.0 by the International Obesity Task Forcefor Asia-Pacific region.
‡WHO standard.

drinking' and 'harmful drinking' (score of 8 or more) were approximately 3.8 times greater in men than in women (p<0.001).

Alcohol consumption habits according to perceived level of stress

Table 2 shows the perceived level of stress and alcohol consumption habits by gender. In both men and women subjects, the HS group consumed more alcohol than the LS group. In terms of quantity of alcohol consumed, subjects with HS showed a higher proportion of alcohol consumption at 5 cups or more than subjects with LS in both men and women. Additionally, the score of 8 or more as classified by the AUDIT score in both men and women subjects with HS was a higher proportion than those with LS. The ORs of all alcohol consumption habits estimated by gender were observed to be homogeneous (p=0.453 for alcohol consumption status, p=0.328 for quantity of alcohol consumption, p=0.591 for AUDIT score). Therefore when controlling for gender, subjects with HS were also a significantly greater proportion to respond with an alcohol consumption habits than subjects with LS [ORs 1.35 (95% CI 1.19-1.54), ORs 1.95 (95% CI 1.68-2.26), ORs 1.87 (95% CI 1.60-2.19), respectively].

Anthropometrics according to perceived level of stress

To detect the perceived level of stress on the anthropometrics by gender-difference, we used a two-way ANOVA. As a result, there were not significantly different on all of the anthropometric variables (p=0.176 for height, p=0.125 for weight, and p=0.683 for BMI). Thus, we analyzed the differences in the anthropometric measurements by gender or the perceived level of stress, respectively (Table 3). Regardless of gender, the height was greater in subjects with the HS than those with LS (p<0.001 for men and women). But the weight of men subjects in the HS group was greater than the LS group (p=0.028), on the other hand, women subjects did not showed the difference of the weight by the perceived level of stress (p=0.246). After controlling for gender, significant differences in height, weight, and BMI were not observed by the perceived level of stress (p=0.935 for height, p=0.407 for weight, p=0.357 for BMI).

Although there was no statistically significant difference between the perceived level of stress and obesity prevalence, men subjects in the HS group had a slightly higher proportion of obesity prevalence than the LS group (36.1% for HS vs 34.7% for LS), whereas women subjects in the HS group had a lower proportion of obesity prevalence than the LS group (29.7% for HS vs 30.4% for LS). As the ORs estimated by gender were observed to be homogeneous (p=0.491), subjects with HS had a slightly lower prevalence of obesity than the LS group after controlling for the gender effect. However, no significant difference between stress and the prevalence of obesity was observed [OR 1.00 (95% CI 0.88-1.14)].

BMI and obesity according to alcohol consumption habits

The effect of alcohol consumption habits on BMI by gender is listed in Table 4. There were significantly different interactions between all alcohol consumption habits and BMI by gender (p<0.001 for alcohol consumption status, p<0.001 for alcohol consumption quantity, and p=0.003 for AUDIT).

Men subjects with that did not consume alcohol had a significantly lower BMI than those who consumed alcohol (p=0.013); in contrast, women subjects that did not consume alcohol had a significantly higher BMI than those who did (p<0.001). Also, men subjects with an alcohol consumption of less than 4 cups significantly showed lower BMI than those with over 5 cups (p<0.001); however, more alcohol consumption in women subjects yielded a marginally lower BMI (p=0.040). Using BMI according to classification of the AUDIT score, men subjects with 'low risk' (score of less than 7) were significantly lower than the subjects with 'alcohol dependence', 'hazardous drinking', and 'harmful drinking' (score of

Table 2. Alcohol consumption habits by perceived level of stress

		Men			Women			Total			*p*-value*
		LS (n=1,797)	HS (n=488)	ORs (95% CI)†	LS (n=2,329)	HS (n=913)	ORs (95% CI)†	LS (n=4,126)	HS (n=1,401)	ORs (95% CI)*	
Consumption status	Non drinking	569 (31.7)	118 (24.2)	1.45	1,538 (66.0)	546 (59.8)	1.31	2,107 (51.1)	664 (47.4)	1.35	0.453
	Drinking	1,227 (68.3)	370 (75.8)	(1.16-1.83)	791 (34.0)	367 (40.2)	(1.12-1.53)	2,018 (48.9)	737 (52.6)	(1.19-1.54)	
Consumption quantity (cups)	≤4	1,035 (57.6)	208 (42.6)	1.83	2,102 (90.3)	743 (81.4)	2.12	1,831 (71.6)	558 (65.8)	1.95	0.328
	≥5	762 (42.4)	280 (57.4)	(1.49-2.24)	227 (9.7)	170 (18.6)	(1.71-2.63)	727 (28.4)	290 (34.2)	(1.68-2.26)	
AUDIT (score)‡	≤7	920 (54.3)	187 (39.7)	1.81	1,606 (89.6)	623 (81.4)	1.97	2,526 (72.5)	810 (65.5)	1.87	0.591
	≥8	774 (45.7)	284 (60.3)	(1.47-2.22)	186 (10.4)	142 (18.6)	(1.55-2.50)	960 (27.5)	426 (34.5)	(1.60-2.19)	

AUDIT: alcohol use disorders identification test.
Data was represented n (%).
*p-values were calculated using Breslow Day test for homogeneity of ORs.
†ORs were calculated using Cochran-Mantel-Haenszel test.
‡WHO standard.

Table 3. Anthropometrics and obesity prevalence by perceived level of stress

		Men (n=2,282)	*p*-value*	Women (n=3,237)	*p*-value*	Total (n=5,519)	*p*-value*	*p*-value**
Height (cm)	LS	169±6.67	<0.001	156±6.67	<0.001	162±9.33	0.935	0.176
	HS	171±6.31		157±6.82		162±9.32		
Weight (kg)	LS	69.2±11.1	0.028	57.4±9.18	0.246	62.5±11.6	0.407	0.125
	HS	70.4±11.2		57.8±9.92		62.2±12.0		
BMI (kg/m^2)	LS	24.1±3.14	0.989	23.6±3.47	0.551	23.8±3.34	0.357	0.683.
	HS	23.6±3.47		23.5±3.84		23.7±3.65		
Obesity prevalence†	LS	622 (34.7)		707 (30.4)		1,329 (32.3)		0.491***
	HS	176 (36.1)		271 (29.7)		447 (31.6)		
	ORs (95% CI)‡	1.06 (0.86-1.31)		0.97 (0.82-1.14)		1.00 (0.88-1.14)		

Data was represented mean±SD or n (%).
*p-values were calculated using t-test.
**p-values were calculated using two-way ANOVA for interaction between gender and perceived level of stress.
***p-values were calculated using Breslow Day test for homogeneity of ORs.
†Obesity was defined as BMI ≥25.0 by the International Obesity Task Force for Asia-Pacific region.
‡ORs (95% CI) were calculated using Cochran-Mantel-Haenszel test.

Table 4. BMI by alcohol consumption habits

		Men (n=2,472)	*p*-value*	Women (n=3,441)	*p*-value*	*p*-value**
Consumption status	Non drinking	23.8±3.01	0.013	23.8±3.57	<0.001	<0.001
	Drinking	24.2±3.21		23.1±3.55		
Consumption quantity (cups)	≤4	23.6±2.98	<0.001	23.6±3.52	0.040	<0.001
	≥5	24.6±3.31		23.1±4.08		
AUDIT (score)†	≤7	23.8±3.00	<0.001	23.4±3.59	0.478	0.003
	≥8	24.4±3.30		23.3±4.05		

AUDIT: alcohol use disorders identification test.
Data was represented mean±SD.
*p-values were calculated using t-test.
**p-values were calculated using two-way ANOVA for interaction between gender and alcohol consumption habits.
†WHO standard.

over 8) (p<0.001), but there was no significant difference in BMI by classification of AUDIT score among women (p=0.478).

The effects of alcohol consumption status (p<0.001) and alcohol consumption quantity (p<0.001) on obesity were significantly different by gender for both), but no significant difference in AUDIT (p=0.083) was observed by gender (Table 5). The odds of being obese with alcohol consumers were significantly 1.28 times (95% CI 1.06-1.55) higher in men but significantly 0.70 times (95% CI 0.60-0.83) lower in women. Among men, the odd of being obese with over 5 cups of alcohol consumption was significantly 1.85 times (95% CI 1.56-2.19) greater. However, those results were not significantly different in women subjects. As the ORs estimated by gender in AUDIT were observed to be homogeneous, after controlling the gender effect, the odds of being obese with a score of over 8 by AUDIT were 1.28 times (95% CI 1.11-1.48) greater.

The interactions between the perceived level of stress and alcohol consumption habits with respect to obesity

We used the CMH-test to analyze the effects of the interaction between the perceived level of stress and alcohol consumption habits on obesity after being stratified by gender (Figure 1). Among men, significant interactions between the perceived level of stress and all alcohol consumption habits with respect to obesity were found [ORs (95% CI)=1.28 (1.06-1.55), 1.81 (1.52-2.16), and 1.40 (1.17-1.68) for alcohol consumption status, alcohol consumption quantity, and AUDIT, respectively]. Among women, interaction between the perceived level of stress and alcohol consumption status in relation to obesity was found to be significant [ORs (95% CI)=0.70 (0.60-0.83)].

DICUSSION

In modern society, most people are living under stress.[20] Many studies have reported that stress was associated with unhealthy lifestyle habits such as smoking, poor eating habits and alcohol consumption,[11-13] and that those influenced obesity.[14,16,21] Therefore, this study investigated the interaction between the perceived level of stress and alcohol consumption habits and their influence on obesity using the KNHANES.

From our results, the subjects with HS showed higher ORs for alcohol consumption status, over 5 cups consumed per usual drinking event, and a score of over 8 in the AUDIT compared with subjects with LS regardless of gender. These results were consistent with earlier studies that found that subjects with high levels of stress had more negative effects from drinking alcohol.[12,22,23] However, the association between the level of stress and the quantity of drinks consumed was inconsistent. Tait & Hulse reported that the association between alcohol consumption and health showed a J-shaped curve.[24] In other words, moderate daily alcohol consumption could improve mental and cognitive health related to stress compared to both heavy drinkers and non-drinkers. In fact, in agreement with our results, both men and women subjects who consumed less than 4 cups of alcohol per day showed a high proportion of LS, but subjects with more than 5 cups of alcohol consumption per day had a greater proportion of HS based on the recommended alcohol consumption dose per day (3-4 cups for men and 1-2 cups for women) (result not shown). These results showed potential that moderate alcohol consumption has a positive effect on mental health by relieving the stress as well as demonstrates the association between quantity of alcohol consumption and stress. Although the underlying mechanism between the interaction of stress and alcohol consumption was unclear, alcohol acted as an agent to relieve anxiety and stress; however, alcohol itself is a stressor that affects brain activity to induce chronic alcoholism.[23] Individuals who feel the more stress show poorer alcohol consumption habits, which in turn cause more stress, leading to vicious cycles of stress and poor alcohol consumption habits. William et al reported that subjects who did not effectively deal with stressful situations had a greater probability of heavier alcohol consumption and alcohol-related problems.[22] These results suggest that it is necessary to develop health-related programs to improve alcohol consumption habits by helping to cope with stressful experiences.

Other epidemiological studies have not shown any association between stress and anthropometric-related obesity, [8-10] in agreement with our results. However, many studies have reported that chronic stress increases the risk of obesity. Rosmond et al reported that continuous perceived stress was associated with perturbed cortisol secretion in 284 Swedish men subjects.[25] Chronic stress led to prolonged increases in cortisol secretion though the hypothalamic-pituitary-adrenal axis, resulting in the

Table 5. Obesity prevalence by alcohol consumption habits

		Men			Women			Total			*p*-value*
		Normal (n=1,626)	Obesity (n=846)	OR (95% CI)†	Normal (n=2,394)	Obesity (n=1,047)	OR (95% CI)†	Normal (n=4,020)	Obesity (n=1,893)	OR (95% CI)†	
Consumption status	Non drinking	472 (31.8)	213 (26.7)	1.28	1,402 (62.0)	684 (69.9)	0.70	1,874 (50.0)	897 (50.5)	0.90	<0.001
	Drinking	1,012 (68.2)	585 (73.3)	(1.06-1.55)	860 (38.0)	295 (30.1)	(0.60-0.83)	1,872 (50.0)	880 (49.5)	(0.80-1.02)	
Consumption quantity (cups)	≤4	1,025 (63.0)	406 (48.0)	1.85	2,112 (88.2)	933 (89.1)	0.92	3,137 (78.0)	1,339 (70.7)	1.44	<0.001
	≥5	601 (48.0)	440 (52.0)	(1.56-2.19)	282 (11.8)	114 (10.9)	(0.73-1.15)	883 (22.0)	554 (29.3)	(1.26-1.65)	
AUDIT (score)‡	≤7	758 (54.1)	347 (45.7)	1.40	1,579 (87.4)	649 (86.8)	1.07	2,337 (72.8)	996 (66.0)	1.28	0.083
	≥8	644 (45.9)	413 (54.3)	(1.17-1.67)	228 (12.6)	100 (13.4)	(0.83-1.37)	872 (27.2)	513 (34.0)	(1.11-1.48)	

AUDIT: alcohol use disorders identification test.
Data was represented n (%).
*p-values were calculated using Breslow Day test for homogeneity of ORs.
†ORs (95% CI) were calculated using Cochran-Mantel-Haenszel test.
‡WHO standard.

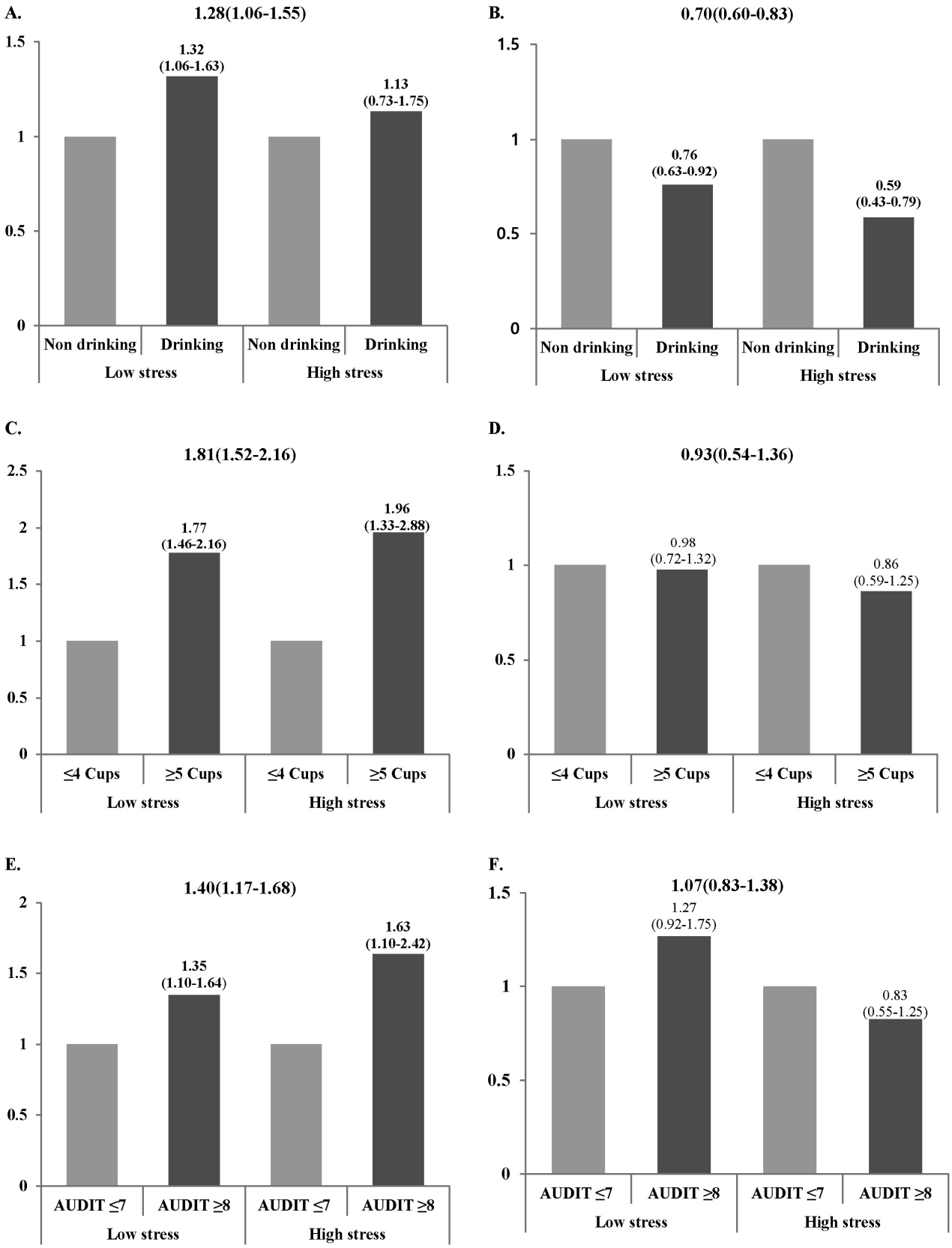

Figure 1. Association of perceived level of stress and drinking habits with obesity. ORs (95% CI) and corresponding P values were calculated using Cochran-Mantel-Haenszel test. A: Alcohol consumption status in men; B: Alcohol consumption status in women; C: Alcohol consumption quantity in men; D: Alcohol consumption quantity in women; E: AUDIT in men; F: AUDIT in women.

dysregulation of cortisol secretion. The aforementioned phenomena increase the risk of visceral obesity. The systematic review study for understanding obesity found that higher stress was correlated with higher body weight, but gender differences were observed.[26] Additionally, Wardle et al identified that the meta-analysis showed a positive significant association between stress and adiposity and concluded that stress was a risk factor for obesity.[7]

There was a significant difference between BMI and obesity prevalence according to drinking habits by gender. Greater alcohol consumption and a higher AUDIT score correlated with a higher BMI and prevalence of obesity for men subjects; however, this trend was opposite for women. The study on obesity and health-related lifestyle in college students showed that subjects with a greater quantity of alcohol consumption significantly increased the degree of obesity,[27] which is in agreement with that of the men in our study. Poortinga reported that heavy alcohol drinkers showed a lack of fruit or vegetables intake.[28] Thus, obesity was considered to be affected by a change in dietary intake rather than directly by alcohol consumption.

Our results showed that gender-based differences in the interaction between the perceived level of stress and alcohol consumption habits with respect to prevalence of obesity were observed. However, there was not any clear trend in the differences. The methods for coping with stress in individuals are divided into aggressive stress relief by increasing physical activity, such as leisure or exercise, or into passive stress relief by unhealthy habits such as alcohol consumption, smoking, or overeating.[29] Therefore, our results considered that these passive stress relief methods showed gender-based differences that may have effects on the obesity.

Using a relatively large population, we found that the perceived level of stress led to differences in alcohol consumption habits, which affected obesity. However, our study has several limitations, which are affected by gender. First, the difference of alcohol consumption by gender was so great; men showed approximately 3.6 times higher proportion of alcohol consumption at 5 cups or more than women. And, there are various differences according to gender; gender's metabolic distinctions are affected by the differences of physiology and temperament. Therefore, future studies will be needed to confirm other statistical methods as well as to identify metabolic difference between men and women.

In summary, our study using KNHANE demonstrated that subjects categorized by the perceived level of stress showed a difference in alcohol consumption habits which affected obesity; these results were dependent on gender. This study will contribute to the establishment of future studies dealing with stress and lifestyle in relation to obesity and the emergence of social problems. In addition, a health care management program needs to be developed to address the maintenance of stress levels to promote healthy habits and prevent the fundamental causes of obesity.

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AUTHOR DISCLOSURES

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Original Article

Association between perceived stress, alcohol consumption levels and obesity in Koreans

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韩国居民主观压力和酒精消费水平与肥胖的关系

背景与目的：精神压力会导致不良的健康习惯，同时也是引起肥胖的原因之一。因此，该研究调查了韩国居民主观压力水平对酒精摄入习惯的影响，以及酒精摄入习惯和精神压力水平交互作用对肥胖的影响。**方法与研究設計：**本研究利用 6229 名韩国居民健康和营养调查资料，分析主观压力、饮酒习惯（目前是否饮酒、饮酒量和酒精使用障碍鉴别试验）和人体测量指标。探讨了基于性别差异的主观压力水平对饮酒习惯和人体测量指标的影响，以及主观压力水平和酒精摄入习惯交互作用对肥胖患病率或肥胖 OR 值的影响。**结果：**主观压力高的不良饮酒习惯比主观压力低的人群高[目前是否饮酒、饮酒量和酒精使用障碍鉴别试验的 ORs（95% CIs）分别为 1.35（1.19-1.54）、1.95（1.68-2.26）和 1.87（1.60-2.19）]。在男性人群，主观压力与饮酒习惯对肥胖有显著的交互作用[目前是否饮酒、饮酒量和酒精使用障碍鉴别试验的 ORs（95% CIs）分别为 1.28（1.06-1.55）、1.81（1.52-2.16）和 1.40（1.17-1.68）]。在女性人群，主观压力与目前是否饮酒以及饮酒量对肥胖交互作用的 ORs（95% CIs）分别为 0.70（0.60-0.83）和 0.93（0.54-1.36）。**结论：**该研究表明，主观压力会影响饮酒习惯，而饮酒习惯可能会影响肥胖。

关键词：饮酒习惯、BMI、韩国国民健康和营养调查、肥胖、主观压力