



## Effects of Alcohol Consumption Frequency on Health Index in Korean Women

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### Abstract

**Background:** In this study, we examined the status of Korean women's alcohol consumption and identified the physical changes they undergo according to the level of consumption. The results of this study may thus be used as raw data to effectively control women's drinking habits.

**Methods:** This study consists of a secondary analysis using data from female participants in the 6<sup>th</sup> Korea National Health and Nutrition Examination Survey, which was conducted by the Korea Centers for Disease Control and Prevention (2013-2014, V-2). In total, 863 women were finally selected to analyze their anthropometric data [height, body weight, body mass index (BMI), and waist circumference], blood parameters (total cholesterol, triglyceride, and feeding glucose), blood pressure profile (systolic/diastolic), and nutrients (carbohydrate, protein, lipid, and total energy intake).

**Results:** Women's alcohol consumption contributed significantly to an increase in body weight, body fat, and BMI as well as to an increase in total energy intake resulting from increased fat consumption. Further, the systolic blood pressure increased significantly when women were exposed to alcohol.

**Conclusion:** The results of this study suggest that alcohol consumption in women is associated with a range of adverse health implications. Notably, an increase in drinking frequency significantly affects their body weight, blood parameters, and nutrients, thus posing substantial health risks to the women, including obesity. Therefore, the Korean government should help women curb their drinking habits through regular training and campaigns.

**Keywords:** Korean women, Alcohol consumption, Health index

### Introduction

As the opportunity for Korean women to participate in social activities increases, their alcohol consumption has also gradually increased. In general, the expansion in women's socioeconomic participation in Korea's economic development is considered positive, but the frequency of alcohol consumption may also lead to a number of social problems. In particular, the marked decrease in physical strength, increase in health risks in unmarried or single women of marriageable age, and advertent drinking habits are deemed to be quite important to most women who participate in economic activities.

The effects of alcohol consumption on the human body vary according to the intake level, and the negative effects are more noticeable than the positive effects. Notably, women have less water in their bodies than men do, so when a man and a woman of the same weight drink the same amount of alcohol, the blood alcohol concentration will tend to be higher in the woman, placing her at a greater risk due to alcohol intoxication. Women's chronic alcohol consumption may also lead to gynecologic problems, including menstrual irregularity, infertility, and premature ovarian failure. This is supported in a study (1) in which the

authors elaborated on the adverse effects of alcohol consumption on the female reproductive organs. Therefore, the drinking habits of modern women can be safely said to be very important to monitor, especially for women of childbearing age. If an unmarried woman continues her drinking habits after marriage without any improvement and continues to drink regularly, then she can put her fetus at risk during her pregnancy. Studies have shown that drinking during pregnancy may also increase the risk for low birth weight or a pre-term newborn (2-5). Heavy drinking during pregnancy may cause malformations (6), mental retardation (7), and physical and mental impairment (7, 8) during childhood and adolescence. As such, since the literature suggests that a childbearing woman who consumes large amounts of alcohol during pregnancy risks damaging her fetus, the current recommendation not to drink during pregnancy is certainly the safest.

There is a widespread belief that alcohol consumption may lead to an excess energy intake, whereas other reports have stated that alcohol consumption may cause malnutrition due to a decrease in food intake. An increase in daily calories consumed in foods (side dishes) taken along with alcohol may increase the body weight, body fat, and body mass index (BMI) (9-11). On the other hand, studies have confirmed the relationship between chronic alcohol abuse and a lower body weight/fat since chronic alcohol abusers do not consume enough food, thus causing malnutrition, weight and fat loss (12-14). Further, chronic alcohol consumption in women may be closely associated with ischemic heart disease (15) and cardiovascular disease risk factors, which may be explained by blood pressure and lipoprotein profile (16).

As described above, improving drinking habits is deemed critical, and it is an important health index for childbearing women. Since an increase in daily calories of food along with alcohol may be foreseeable in all age brackets, women's alcohol consumption may have a profound impact on their body weight, body fat, and circulatory system. To this end, this study examined the effects of drinking habits on the health index in Korean

women (aged between 20 and 50years). The authors hope that the results of this study may be used as raw data to effectively control women's drinking habits.

## **Methods**

### *Data collection*

In this study, we carried out a secondary analysis using data from the 6<sup>th</sup>Korea National Health and Nutrition Examination Survey, conducted by the Korea Centers for Disease Control and Prevention (2013-2014, V-2). The data consisted of three examinations on health, diagnosis, and nutrition. The health and diagnosis survey was conducted in mobile health centers, and the nutrition survey was based on a personal interview conducted by the nutrition team in a direct visit to each household. The screening items of the participants included in this study were age, drinking frequency, height, body weight, BMI, waist circumference, total cholesterol, triglyceride, feeding glucose, blood pressure (systolic and diastolic), nutrient composition (carbohydrate, lipid, and protein) and total energy consumption.

### *Study subjects*

A total of 1,025 subjects were screened for this study. Of these, there were 803 women aged between 20 to less than 50 years. After excluding 120 women due to insufficient responses in their questionnaires and missing blood tests, we selected 683 women. Their demographic characteristics are shown in Table 1.

### *Measurement and analysis method*

1) BMI, waist circumference, and blood pressure  
BMI ( $\text{kg}/\text{m}^2$ ) was calculated as the weight (kg) divided by the square of the height (m). Waist circumference (cm) was taken with a tape measure as the midway point between the costal margin and iliac crest in the mid-axillary line, with the subject standing and breathing normally. Systolic and diastolic blood pressures were recorded by the nurse-in-charge, and we used blood pressure by correcting an error generated from the differences in arm height.

**Table 1:** Physical characteristics of subjects

Characteristics		M±SD
Age (yr)	No alcohol consumption (n=249)	37.90±7.76
	Once a month (n=207)	34.78±8.91
	2 times or more a month (n=227)	35.20±8.91
	Total (n=683)	36.06±8.61
Height (cm)	No alcohol consumption (n=249)	159.48±5.30
	Once a month (n=207)	160.53±5.45
	2 times or more a month(n=227)	160.42±5.43
	Total (n=683)	160.11±5.43
Body weight (kg)	No alcohol consumption (n=249)	55.92±7.69
	Once a month (n=207)	58.02±10.46
	2 times or more a month(n=227)	59.09±10.13
	Total (n=683)	57.61±9.50
BMI	No alcohol consumption (n=249)	22.02±3.12
	Once a month (n=207)	22.49±3.95
	2 times or more a month(n=227)	22.94±3.81
	Total (n=683)	22.47±3.64

## 2) Blood analysis:

Blood lipid levels (total cholesterol, triglyceride) and feeding glucose were determined using an automatic biochemical analyzer (Hitachi Automatic Analyzer 7600, Japan).

### *Ethical note*

This survey was conducted under the approval of the Research Ethics Review Committee of Korea Centers for Disease Control and Prevention, and the protocol of this study was approved by Korea National Health and Nutrition Examination Survey (Project No. 2015-01-02-6C).

### *Statistical Analysis*

Data were validated and analyzed using SPSS version 18.0 (Chicago, IL, USA). Quantitative variables were summarized using the mean and standard deviation. One-way ANOVA was used to assess the differences among 3 groups. If there were differences among the 3 groups, a Tukey (post-hoc) test was performed. Statistical significance was assumed at  $P<.05$ .

## Results

### *Anthropometric and blood parameters according to drinking frequency in women*

The differences in the anthropometric and blood parameters according to women's drinking fre-

quency are presented in Table 2. When the differences in anthropometric parameter according to women's drinking frequency were analyzed at a significance level of  $P<.05$ , significant differences for weight ( $F=7.014$ ,  $P=.001$ ), waist circumference ( $F=7.943$ ,  $P=.000$ ), and BMI ( $F=3.822$ ,  $P=.022$ ) were observed, whereas no significant differences for total cholesterol, triglyceride, and feeding glucose were noted among the 3 groups.

### *Energy intake and blood pressure according to drinking frequency in women*

The differences in energy intake and blood pressure according to women's drinking frequency are presented in Table 3. When the differences in anthropometric parameter according to women's drinking frequency were analyzed at a significance level of  $P<.05$ , significant differences were observed for total energy intake ( $F=3.012$ ,  $P=.050$ ), lipid ( $F=3.863$ ,  $P=.021$ ), systolic blood pressure ( $F=4.910$ ,  $P=.008$ ), whereas no statistically significant differences were determined for carbohydrates, protein, and diastolic blood pressure.

## Discussion

This study was carried out to identify Korean women's alcohol drinking habits and to examine

their health index related to alcohol consumption. Overall, Korean women do not enjoy binge

drinking, but we confirmed that alcohol intake posed adverse health risks.

**Table 2:** Differences in anthropometric and blood parameters according to women’s drinking frequency  
a =No alcohol consumption, b= Once a month, c= 2 times or more a month

Parameter	Drinking frequency	N	M±SD	F	P	post-hoc
Body weight (kg)	No alcohol consumption	249	55.92±7.69	7.014	.001	a < b, c
	Once a month	207	58.02±10.46			
	2 times or more a month	227	59.09±10.13			
Weight circumference (cm)	No alcohol consumption	249	73.42±7.66	7.943	<b>.000</b>	a < b, c
	Once a month	207	74.38±9.61			
	2 times or more a month	227	76.63±9.60			
BMI (kg/m <sup>2</sup> )	No alcohol consumption	249	22.02±3.12	3.822	.022	a < c
	Once a month	207	22.49±3.95			
	2 times or more a month	227	22.94±3.81			
Total cholesterol (mg/dl)	No alcohol consumption	249	181.87±30.67	.512	.600	
	Once a month	207	179.18±31.56			
	2 times or more a month	227	181.80±32.11			
Triglyceride (mg/dl)	No alcohol consumption	249	94.21±115.12	1.719	.180	
	Once a month	207	86.35±50.42			
	2 times or more a month	227	101.90±77.85			
Bleeding glucose (mg/dl)	No alcohol consumption	249	92.16±20.05	1.832	.161	
	Once a month	207	91.60±13.50			
	2 times or more a month	227	94.95±23.99			

**Table 3:** Differences in energy intake and blood pressure according to women’s drinking frequency  
a =No alcohol consumption, b=Once a month, c=2 times or more a month

Parameter	Drinking frequency	N	M±SD	F	P	post-hoc
Total energy intake (kcal)	No alcohol consumption	249	1746.10±436.66	3.012	.050	a < c
	Once a month	207	1846.93±806.26			
	2 times or more a month	227	1898.10±791.52			
Carbohydrate (g)	No alcohol consumption	249	274.35±83.36	1.033	.357	
	Once a month	207	268.85±110.11			
	2 times or more a month	227	261.07±109.42			
Lipid (g)	No alcohol consumption	249	41.59±22.89	3.863	.021	a < b
	Once a month	207	49.43±38.21			
	2 times or more a month	227	46.44±29.89			
Protein (g)	No alcohol consumption	249	61.59±21.87	1.882	.153	
	Once a month	207	66.44±35.99			
	2 times or more a month	227	66.75±38.48			
Systolic blood pressure (mmHg)	No alcohol consumption	249	105.65±10.34	4.910	.008	a < c
	Once a month	207	106.40±11.19			
	2 times or more a month	227	108.70±11.36			
Diastolic blood pressure (mmHg)	No alcohol consumption	249	70.62±8.49	1.990	.137	
	Once a month	207	70.62±8.72			
	2 times or more a month	227	72.03±8.91			

A meta-analysis of a previous study on Korean adults (17) indicated that mild drinking of less than 4 times a month or a weekly amount less than 90 g showed a beneficial effect on cardiovascular mortality. However, different criteria for mild alcohol consumption between studies make it difficult to compare such results. In this study, the body weight and waist circumference were found to be significantly higher in subjects who consumed alcohol once a month and 2 times or more a month than subjects who did not consume alcohol. BMI was the highest in those who consumed alcohol 2 times or more a month. However, there were no significant differences among the groups in terms of the blood parameters, including total cholesterol, triglyceride and feeding glucose, which implied that body weight gains did not significantly affect blood parameters. Consequently, an increase in the waist circumference and body weight may trigger coronary heart disease (CHD) and can be associated with an increased risk of breast cancer and menopause in women.

In a meta-analysis of light alcohol drinking and breast cancer (18), the authors recommended for any type of drinking to be strongly discouraged since light drinking can increase the risk of breast cancer due to an increase in the levels of tumor markers within the blood. Studies have also concluded similar deductions (19-20). A study in Japan (21) investigated the associations between weight gain and alcohol drinking with breast cancer risk in pre- and post-menopausal women and reported that a higher weight gain and larger amounts of ethanol intake were significantly associated with an increased risk of breast cancer in Japanese postmenopausal women, while alcohol consumption was less related to breast cancer risk in Japanese premenopausal women. Since continuous drinking habits in women from premenopause to post-menopause might be associated with an increased risk of breast cancer, coupled with higher weight gain, Nitta recommended that alcohol consumption be as low as possible from pre-menopause to maintain a healthier life after menopause, among other things. In studies on female rat reproductive function, the

metabolism of ethanol to acetaldehyde and an increased susceptibility to oxidative stress were associated with the stimulation of follicle-stimulating hormone (FSH), which could play a role in ovarian tissue cell injury in rats of gestational age (22-23). This suggests that alcohol consumption should be advertently considered in childbearing women, and alcohol consumption during pregnancy in women with a weak uterine function should be absolutely prohibited.

This study revealed no differences in the consumption of carbohydrates and protein according to drinking frequency, and the amount of lipids and total energy intake were significantly higher in drinking groups than in the group that did not consume alcohol. Although there were no significant differences in diastolic blood pressure, the systolic blood pressure was significantly lower in the group consuming alcohol 2 times or more a month than in the group taking no alcohol. This implies that the increase in total energy intake induced by the increase in alcohol consumption frequency resulted in an increase in body weight, body fat, and BMI, thus triggering the elevation of blood pressure due to a reduction in the elasticity of the blood vessels.

Another study (24) emphasized the importance of subjects' health and physical strength in that moderate alcohol consumption in healthy people showed no adverse effects on CHD compared to light alcohol drinking in people with weak physical strength, which affected the clinical manifestation of CHD, although different criteria to control alcohol consumption between studies might produce diverse outcomes. Further, a meta-analysis of alcohol drinking in male and female adults in Korea concluded that different results caused by three factors (diverse criterion of mild drinking, the subjects, and the sample size) made it difficult to accurately assess the effect of alcohol consumption (17).

Another study on alcohol consumption and blood pressure indicated that an increase in alcohol intake induced an elevation in blood pressure, and men with a severe form of hypertension showed more than a 10-fold increased risk for cardiovascular disease mortality associated with



heavy binge drinking (26). In a study (27) of the mechanism for prevention of alcohol-induced hypertension reported that the following factors in alcohol drinking might be associated with elevation of blood pressure: an imbalance of the central nervous system, impairment of baroreceptors, enhanced sympathetic activity, oxidative injury of the endothelium, stimulation of the renin-angiotensin system and aldosterone system (RASAS), increased cortisol levels, and increased vascular reactivity due to an increase in intracellular calcium levels.

The results of this study suggest diverse outcomes depending on the individual differences in Korean women who consumed relatively mild quantities of alcohol. Since the study population was aged 20 to 50 years and was comprised of both childbearing and postmenopausal women, it is rather plausible for these women to be able to control their alcohol consumption under the condition that they can maintain better health in terms of environmental and physical factors. Further, it is imperative for alcohol consumption during pregnancy to be discouraged.

## Conclusion

This study implies that relatively moderate amounts of alcohol are associated with adverse health consequences in Korean women, and an increase in frequency of alcohol drinking led to an increase in body weight, BMI, lipid, total energy intake and systolic blood pressure, suggesting that light alcohol consumption poses diverse health implications depending on the environment (occupation, region, and educational level) and physical condition. Among other things, alcohol consumption should be strongly discouraged in women who are pregnant and/or have high blood pressure. A government-level campaign should thus promote public awareness of Korean women's alcohol consumption. Further studies are also required to assess accurately daily alcohol consumption of Korean women per age bracket, and based on the research outcomes, the effects of alcohol intake on the health index of

women should be investigated in a more detailed manner.

## Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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