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Research Article

Body weight–dependent relationships between alcohol consumption and pulse pressure in middle-aged Japanese women

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Abstract

High pulse pressure is a risk factor for cardiovascular disease, and excessive alcohol drinking increases the risk of hypertension. The purpose of this study was to elucidate the relationship between alcohol intake and pulse pressure in women and to determine whether body weight influences their relationship. The subjects were 18,791 Japanese middle-aged women, and they were divided into tertile groups for body weight or three different body mass index (BMI, kg/m^2) groups (low BMI <22; middle BMI ≥ 22 and <25; high BMI ≥ 25). The subjects in each group were further divided into four groups of nondrinkers, occasional drinkers, regular light drinkers, and regular heavy drinkers by habitual alcohol consumption. Pulse pressure levels were compared between nondrinkers and drinkers in each group for body weight or BMI. Pulse pressure was significantly higher in regular heavy drinkers than in nondrinkers in the first tertile group for body weight and in the low BMI group but not in the second and third tertile groups for body weight and in the middle and high BMI groups. In all tertile groups and all BMI groups, pulse pressure was not significantly different in occasional drinkers and regular light drinkers than in nondrinkers. In women with lower body weight, heavy drinking was positively associated with pulse pressure, while this association was not found in women with middle or higher body weight. Thus, body weight potently confounds the relationship between alcohol consumption and pulse pressure. J Am Soc Hypertens 2017;■(■):1–10.

Keywords: Arterial stiffness; obesity.

Introduction

Habitual alcohol drinking influences cardiovascular health both beneficially and harmfully, depending on the amount of alcohol consumption. Light-to-moderate alcohol drinking reduces the risk of coronary heart disease mainly through elevation of blood HDL cholesterol level and inhibition of blood coagulation.[1,2] On the other hand, excessive alcohol drinking results in an increase in the risk of stroke,[3,4] in which alcohol-induced hypertension is deeply involved.[5] Both systolic and diastolic blood pressures have been shown to be lowered by reduction of alcohol intake.[6] However, there has been limited information on the relationship between alcohol drinking and pulse pressure. In addition, previous findings on their relationship are conflicting. According to a study in France in which data for men and women were analyzed separately, pulse pressure was inversely associated with alcohol intake, was lowest in light and moderate drinkers, and was highest in nondrinkers.[7] In three previous studies conducted in the Netherlands, China, or Mediterranean countries in which data for male and female subjects were analyzed together, no significant association was found between alcohol intake and pulse pressure.[8–10] In a study in which data for men and women in the USA were analyzed[11] and in two studies in which data for Japanese men were analyzed,[12,13] there was a positive association between alcohol intake and pulse pressure. The reasons for the above discrepancies regarding the results for the relationship between alcohol and pulse pressure remains unknown, but positive associations of

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heavy alcohol drinking with systolic and diastolic blood pressures were consistent in previous studies.[14]

The association between alcohol and blood pressure has been reported to be potently affected by body weight in Japanese men and women: Both of the associations of alcohol with systolic and diastolic blood pressure levels were much weaker in men and women with high body weight than in those with low body weight.[15,16] However, there have been no reports on whether body weight affects the relationship between alcohol and pulse pressure. Moreover, there have been few reports showing a relationship between alcohol and pulse pressure in women alone. Therefore, the purpose of the present study was to investigate the relationships between alcohol and pulse pressure in Japanese women with different levels of body weight or body mass index (BMI).

Methods

Subjects

The subjects were 18,791 Japanese women aged ≥35 and <60 years who had received periodic health examinations at workplaces in Yamagata Prefecture in Japan. A cross-sectional study was performed using a local population-based database for the above subjects. This study was approved by the Ethics Committee of Yamagata University School of Medicine. In a questionnaire at the health checkup, subjects were required to identify any conditions for which they were receiving treatment. Those having an antecedent or current history of cardiovascular disease including stroke and ischemic heart disease were excluded from the subjects of this study. The questionnaire also surveyed the subjects' histories of alcohol consumption, cigarette smoking, and habitual exercise. The subjects were also divided into three groups based on average daily cigarette consumption (nonsmokers; light smokers, less than 20 cigarettes per day; heavy smokers, 20 or more cigarettes per day). Subjects who exercised almost every day for 30 minutes or longer per day were defined as those with a regular exercise habit.

Classification of Drinker Groups

Subjects were divided into four groups of nondrinkers, occasional drinkers, regular light drinkers, and regular heavy drinkers by frequency and amount of drinking as follows. The frequency of habitual alcohol drinking was assessed using the following questionnaire item: ''How frequently do you drink alcohol?''. The frequency of weekly alcohol drinking was categorized as ''every day'' (regular drinkers), ''sometimes'' (occasional drinkers), and ''never'' (nondrinkers). The usual daily alcohol consumption was calculated in terms of the equivalent number of ''go,'' a traditional Japanese unit of sake (rice wine). The amounts of other alcoholic beverages, including beer, wine, whisky, and shochu (a traditional Japanese distilled spirit), were converted and expressed as units of ''go.'' One go corresponds to approximately 180 mL of sake, 500 mL of beer, 240 mL of wine, 60 mL of whisky, and 80 mL of shochu. The amount of alcohol consumed daily was categorized as ''null,'' ''less than one go per day,'' ''one go or more but less than two go per day,'' ''two go or more but less than three go per day,'' and ''three go or more per day.'' One ''go'' contains about 22 g of ethanol, and this amount was used to separate heavy drinkers from light drinkers since it is generally accepted that alcohol intake should be reduced to less than 20–30 g per day from the viewpoint of preventing hypertension.[17,18] The average daily alcohol intake (grams of ethanol per day) was then calculated.

Measurements

Height and body weight were measured in light clothes at the health checkup. BMI was calculated as weight in kilograms divided by the square of height in meters. Waist circumference was measured at the navel level according to the recommendation of the definition of the Japanese Committee for the Diagnostic Criteria of Metabolic Syndrome.[19] The ratio of waist circumference (cm) to height (cm) (waist-to-height ratio) was used for evaluation of visceral adiposity.

Blood pressure was measured by trained nurses, who were part of the local health checkup company, with a mercury sphygmomanometer once on the day of the health checkup after each subject had rested quietly in a sitting position. Korotkoff phase V was used to define diastolic pressure. Normal blood pressure was defined as systolic blood pressure of <140 mm Hg and diastolic blood pressure of <90 mm Hg. Hypertension was defined as systolic blood pressure of ≥140 mm Hg and/or diastolic blood pressure of ≥90 mm Hg.[18] In addition, subjects who were receiving drug therapy for hypertension were included in the hypertensive group regardless of blood pressure levels. Pulse pressure was calculated as the difference between systolic and diastolic blood pressures, and pulse pressure of 60 mm Hg or higher was defined as high pulse pressure.[18]

Fasted blood was sampled from each subject in the morning, and serum HDL cholesterol and LDL cholesterol levels were measured by enzymatic methods using commercial kits, cholestest N-HDL and cholestest LDL (Sekisui Medical Co, Ltd, Tokyo, Japan), respectively. The coefficients of variation for the reproducibility of measurement were ≤5% for HDL cholesterol and LDL cholesterol. Hemoglobin A1c was measured by the NGSP (National Glycohemoglobin Standardization Program)–approved technique using the latex cohesion method with a commercial kit (Determiner HbA1c, Kyowa Medex, Tokyo, Japan). The coefficient of variation for reproducibility of hemoglobin A1c measurement was ≤5%. Since the standards of