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Original Research

Association between Alcohol Consumption and Glycemic Status in Middle-Aged Women

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ABSTRACT

Objectives: Habitual alcohol drinking has been shown to reduce the risk for diabetes by recent meta-analysis studies. However, it remains to be clarified whether the relationship between alcohol and diabetes is influenced by adiposity. The purpose of this study was to determine whether glycemic status is influenced by alcohol drinking in women.

Methods: The subjects were 18 352 Japanese women, 35 to 60 years of age, who underwent health check-up examinations. The subjects were divided into 4 groups: nondrinkers, occasional drinkers, regular light drinkers (<22 g ethanol/day) and regular heavy drinkers (≥22 g ethanol/day). The relationship between alcohol consumption and glycated hemoglobin (A1C) levels was investigated by using analysis of covariance and logistic regression analysis with adjustment for age and histories of smoking and regular exercise.

Results: A1C levels were significantly lower in occasional, regular light and regular heavy drinkers than in nondrinkers and was significantly lower in regular light and heavy drinkers than in occasional drinkers. These inverse associations were not altered by adiposity status as evaluated by body mass index and waist-to-height ratios. Odds ratios versus nondrinkers for hyperglycemia were significantly lower ($p<0.01$) than the reference level of 1.00 in occasional drinkers (0.82 [95% confidence interval 0.73 to 0.92]); regular light drinkers (0.61 [95% CI: 0.44 to 0.85]) and regular heavy drinkers (0.66 [95% CI: 0.50 to 0.88]).

Conclusions: The results suggest that glycemic status is inversely associated with alcohol drinking independent of adiposity status in Japanese women. This may be related to the known lower risk for cardiovascular disease in female drinkers.

Mots clés :
alcool
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RÉSUMÉ

Objectifs : De récentes études de méta-analyse ont montré qu'une consommation routinière d'alcool réduit le risque de diabète. Cependant, il reste à clarifier si la relation entre alcool et diabète est influencée par l'adiposité. Le but de cette étude était de déterminer si le statut glycémique est influencé par la consommation d'alcool chez les femmes.

Méthodes : Les sujets étaient 18 352 femmes japonaises, de 35 à 60 ans, qui ont subi des examens bilans de leur état de santé. Les sujets ont été divisés en 4 groupes: les non-buveurs, les buveurs occasionnels, les buveurs réguliers légers (<22 g d'éthanol/jour), et les gros buveurs réguliers (≥22 g d'éthanol/jour). La relation entre consommation d'alcool et niveau d'hémoglobine glyquée (HbA1c) a été étudiée en utilisant une analyse de covariance et une analyse de régression logistique avec ajustement pour l'âge et les antécédents de tabagisme et l'exercice régulier.

Résultats : Les taux d'HbA1c étaient significativement plus faibles pour les buveurs réguliers légers et les gros buveurs par rapport aux buveurs occasionnels. Ces associations inverses n'étaient pas modifiées par le taux d'adiposité défini par l'indice de masse corporelle et le rapport tour de taille-taille. Les rapports de cotes d'hyperglycémie des non-buveurs étaient significativement plus faibles ($p<0,01$) que le niveau de référence de valeur 1,00 chez les buveurs occasionnels (0,82 [intervalle de confiance de 95% (IC 95%) de 0,73 à 0,92]); les buveurs réguliers légers (0,61 [IC 95%: 0,44 à 0,85]); et les gros buveurs réguliers (0,66 [IC 95%: 0,50 à 0,88]).

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Conclusions : Les résultats suggèrent que le statut glycémique est inversement associé à la consommation d'alcool indépendamment du taux d'adiposité chez les femmes japonaises. Cela peut être lié à un risque connu de maladie cardiovasculaire plus faible chez les buveurs de sexe féminin.

Introduction

Recent systemic reviews showed an inverse association between moderate alcohol drinking and the incidence of diabetes (1,2). However, it is still under debate whether there is a causal relationship between habitual alcohol drinking and the incidence of diabetes. In contrast, moderate to heavy drinkers have been reported to show higher risk for diabetes compared with nondrinkers in Japanese people, and this association reportedly depended on body mass index (BMI); alcohol was a risk factor for diabetes in men with low BMIs, whereas alcohol consumption was associated with reduced risk for diabetes in men with middle to high BMIs (3–5). Thus, there is a possibility that adiposity confounds the relationship between alcohol drinking and the risk for diabetes in men. On the other hand, no association between alcohol consumption and incident diabetes has been reported in Japanese women (5).

Previous cross-sectional and case-control studies showed inverse associations between alcohol intake and levels of glycated hemoglobin (A1C) (6–8). A recent prospective case-control study analyzing data from 8 European countries showed that the inverse association between alcohol consumption and diabetes was more pronounced in overweight women than in those with normal weight (9). However, it remains unknown whether the relationship between alcohol drinking and glycemic levels and the prevalence of diabetes are influenced by adiposity in women.

The purpose of this study was, therefore, to clarify the relationships between alcohol intake and glycemic status in middle-aged Japanese women with differing adiposity levels as evaluated by BMI and waist circumference corrected by height, waist-to-height ratio (WHtR).

Methods

Subjects

The subjects were 18 352 Japanese women, 35 to 60 years of age, 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 check-up, subjects were required to identify any conditions for which they were receiving treatment. Subjects with histories of drug therapy for diabetes were excluded from the study. The therapy included insulin therapy, but no precise information on kind of oral antidiabetic medication given to each subject was available for this study. The questionnaire also surveyed the subjects' histories of alcohol consumption, cigarette smoking and habitual exercise. The subjects were also divided into 3 groups based on average daily cigarette consumption (nonsmokers; light smokers, fewer than 20 cigarettes per day; and heavy smokers, 20 or more cigarettes per day). Subjects who exercised almost every day for 30 minutes or longer were defined as those with regular exercise habits.

Classification of drinker groups

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). Thus, drinkers were first classified by the frequency of drinking into 3 groups: non-, occasional and regular drinkers. Regular drinkers were further classified by amount of daily alcohol intake into regular light drinkers and regular heavy drinkers. 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, whiskey 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 whiskey and 80 mL of shochu. The amount of alcohol consumed daily was categorized as null (less than 1 go per day); 1 go or more, but less than 2 go per day; 2 go or more, but less than 3 go per day and 3 go or more per day. One go contains about 22 grams of ethanol, and this amount was used to separate heavy drinkers from light drinkers because it is generally accepted that alcohol intake should be reduced to less than 20 to 30 grams per day from the viewpoint of preventing hypertension (10,11). Then the average daily alcohol intake (grams of ethanol per day) was calculated. Light and heavy drinkers were defined as those consuming less than 22 grams per day of ethanol and 22 grams per day or more, respectively. Thus, subjects were finally classified by status of their alcohol consumption into 4 groups: nondrinkers, occasional drinkers, regular light drinkers and regular heavy drinkers.

Measurements

Height and body weight were measured in light clothes at the health check-up. BMIs were calculated as weight in kilograms divided by the square of height in metres. Waist circumference was measured at the navel level, according to the recommendations of the Japanese Committee for the Diagnostic Criteria of Metabolic Syndrome (12).

Fasting blood was sampled from each subject, and A1C levels were determined by the National Glycohemoglobin Standardization Program (NGSP)-approved latex cohesion method using a commercial kit (Determiner HbA1c; Kyowa Medex, Tokyo, Japan). The coefficient of variation for reproducibility of the A1C measurement was $\leq$5%. Because the A1C measurement standards differ between the NGSP and the Japan Diabetes Society (JDS) methods, the A1C values were calibrated by using a formula proposed by the JDS (13): hemoglobin A1C (NGSP) (%) $=1.02 \times$ hemoglobin A1C (JDS) (%) $+0.25\%$. Subjects with hyperglycemia and diabetes were defined as those with A1C levels equal to or above 5.7% and 6.5%, respectively, according to the criteria of the American Diabetes Association (14).

Statistical analysis

Statistical analyses were performed using a computer software program (SPSS v. 16.0 J for Windows, Chicago, illinois, USA). The frequency of each variable was compared between each pair of groups using the chi-square test or the Fisher exact probability test for independence, and all possible paired comparisons of 4 groups (6 comparisons) were performed. In the univariate analysis, the means of each variable were compared among the groups by using analysis of variance (ANOVA) followed by the Scheffé F test as a